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NATURE

A WEEKLY ILLUSTRATED JOURNAL OF SCIENCE.

"To the solid ground
Of Nature trusts the mind which builds for aye."—WORDSWORTH.

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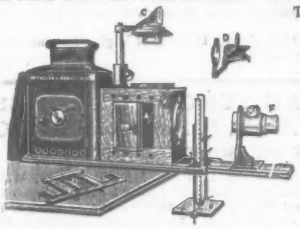

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GEOLOGICAL SOCIETY OF LONDON.

The ANNIVERSARY MEETING of this Society will be held at the SOCIETY'S APARTMENTS, BURLINGTON HOUSE, on FRIDAY, FEBRUARY 21, at 3 o'clock.

KEBLE COLLEGE, OXFORD.

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STAFFORDSHIRE EDUCATION COMMITTEE.

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Salary offered £250 to £300 per annum, according to qualifications.

Further particulars and form of application may be obtained from the undersigned, by whom applications must be received on or before 5th March, 1919.

C. F. MOTT, Acting Director of Higher Education.

County Education Offices, Stafford.

January, 1919.

SOUTH AFRICAN SCHOOL OF MINES AND TECHNOLOGY, JOHANNESBURG

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LECTURER IN MATHEMATICS.

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ROYAL TECHNICAL INSTITUTE, SALFORD.

Principal—B. PRENTICE, D.Sc., Ph.D.

LECTURER in ELECTRICAL ENGINEERING wanted, to commence March 1. Engineering degree and works experience essential. Salary according to scale and teaching experience. Particulars and forms of application may be obtained from the SECRETARY to the Education Committee, Education Office, Chapel Street, Salford, and must be returned not later than February 19.

L. C. EVANS, Town Clerk.

UNIVERSITY COLLEGE, NOTTINGHAM.

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The Council of the College invite applications for the post of SENIOR LECTURER IN ELECTRICAL ENGINEERING. Commencing salary £300 per annum.

Further particulars and application forms may be obtained from the REGISTRAR, to whom applications must be sent not later than March 3.

UNIVERSITY COLLEGE, NOTTINGHAM.

PROFESSOR OF ECONOMICS.

The Council of the College invite applications for the CHAIR OF ECONOMICS. Commencing salary £500 per annum.

Further particulars and forms of application may be obtained from the REGISTRAR, to whom applications must be sent not later than March 3.

BIRKBECK COLLEGE, LONDON.

ASSISTANT LECTURER IN CHEMISTRY.

The Governing Body invite applications for the above appointment. Commencing salary £220–250 (according to experience and qualifications), with regular increments. Applicants specially qualified in Inorganic and Physical Chemistry preferred. Applications to the SECRETARY, Birkbeck College, E.C. 4, from whom further particulars may be obtained.

WORKS CHEMIST wanted by fine colour,

paint, and chemical manufacturers in country district near London. Applicants must be under 30, capable of training and controlling small number of employees, and becoming the right hand of energetic Managing Director. Business as well as scientific ability essential. Salary £250 and commission.—Write, stating qualifications, experience, &c., to Box 72, c/o NATURE Office.

WANTED, ANALYTICAL CHEMIST

(under 30) at an Iron Works in Derbyshire. Will be required to carry out routine metallurgical analysis, and analytical work in connection with potash investigations. Salary £200 per annum.—Apply Box 182, c/o NATURE Office.

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Chemical Society, 1891 to 1914 (1912 to 1914 unbound—others bound); Journal of Society of Chemical Industry, 1894 to 1898 bound—also 1899 and 1899 to 1906 unbound, but about 20 parts missing; Berichte, 1891, unbound.

Box 13, c/o NATURE Office.

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"NATURE." Unbound copies, Nos. 2184

to 2336 inclusive (October 26, 1911, to August 6, 1914), except following, which are missing: Vol. 89, parts 2227–2235 inclusive; Vol. 90, part 2236. Also Inman's Nautical Tables, 1913 edition. What offers?—Box 184, c/o NATURE Office.

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THURSDAY, FEBRUARY 13, 1919.

THE SCIENTIFIC MAN'S BURDEN.

The Twin Ideals: An Educated Commonwealth. By Sir James W. Barrett. Vols. i. and ii. Pp. xxxii+512 and xx+504. (London: H. K. Lewis and Co., Ltd., 1918.) Price 25*s.* net.

THESE volumes consist of a series of essays and articles, mostly written originally for the daily Press, on a very large variety of topics, classified under the heads:—Universities; education; medicine; venereal disease; milk and neglected children; town planning and playgrounds; rural life; national parks and the work of explorers; bush nursing; travel and immigration; social; music; electoral reform; Imperial and Australian politics. The author, a Melbourne medical man and consultant, who has taken an active part in the affairs of the Melbourne University, in Australian public and medical questions, and, during the war, in the Australian Army Medical Corps, tells in his preface of the growth of his own faith, away from the original university ideal of leavening the affairs of State by the production of a few well-trained thinkers, towards the twin ideals of Imperial federation and the production of an educated proletariat as necessary for the salvation of the Empire. The first is necessary for the security precedent to any scheme of social betterment, without which the foundations of society are hollow, and the second, the effective education of all adolescents in realities, is forced by the spectacle in Australia of the superficiality and insincerity of popular government. But is not the original university ideal of at least equal importance?

Reflected in these essays is the special need of the younger and vigorous communities of our Empire and America, overflowing with natural wealth, as regards education in an early stage of development, except as concerns the immediate business of life, looking to the universities for guidance and service in their work, rather than in their thoughts, confounding leisure with idleness, apt to consider research, except for utilitarian ends, as snobbery, and culture, unless carefully hidden, as a source of offence to the average man. Whether from these beginnings anything will ultimately follow as worthy of the name of real progress and abiding advancement as has come out of the old universities of Europe, with their monastic origins, has yet to be seen. Instruction in, and the utilisation, dissemination, and popularisation of, knowledge is one thing; no one doubts its necessity and importance; but the getting of knowledge is another. For the latter objective the atmosphere of a monastery would seem to be more suited than the bustle and turmoil attendant upon making adequate returns in social service for pecuniary benefits received, or piously anticipated, which seems to be the ideal, here over-extolled, of what a modern university should be.

No one will want to quarrel with the author for his long and arduous public work in insisting upon the national and social importance of educating the proletariat to the highest attainable point, of disseminating amongst the workers of the world all the science that is of any concern to them in their work. Also, what in older countries than Australia is at least as important is to fill their hours of leisure and release from the monotony of life with the accumulated intellectual spoils of the ages. If, moreover, it be considered that the universities are the best-fitted instruments for this work, let it only be remembered that something more than mere lip-service is due to their original ideals. Let those who want to advance knowledge, and not shout about it, be given back at least the modern equivalent of the monastery, and be left to their work in peace. In point of social service their contribution may prove to be as important as, for example, the running of "more and better live-stock special cars" for the education of the agricultural community. But this is precisely the point that those who want the universities to enter into the life of the community more closely will not honestly and fully concede. "Sporting the oak" to the world, and shutting out the interminable chatter about it, is to them either sheer superciliousness, or else mistaken recluseness, for which closer contact with their fellow-men and acquaintance with the needs, thoughts, and aspirations of the great world are to be prescribed.

In his controversy with Prof. Masson, of which surely the reader ought to have been given both sides, and his article on "The Man of Science" especially, the author seems not to have appreciated the real position, apart altogether from current popular estimation, filled by the creator of new knowledge in the community. The man of science is regarded as in need of reform no less than other people before he can be considered a successful popular leader, which is as true as is the futility of expecting figs from thistles. Elbert Hubbard is quoted to the effect that Nature intends knowledge for service, not as an ornament or for the purposes of *bric-à-brac*. A man of science would, perhaps, not care to dogmatise as to the intentions of Nature, but he would almost certainly regard as a dangerous lunatic anyone who in the twentieth century considered knowledge as ornamental. He might point to the advisability, before cooking a hare, of catching it. The application of science to service, if it is to be regarded as the proper work of the man of science, can only be at the expense of his own work. If the argument merely is that, unless the man who catches the hare can either cook it or catch it cooked, he will never have that position of honour and esteem in the community which is his due, that matter will surely right itself. For the community will not continue to exist, and will not deserve to, in competition with those that are more intelligent, or, at least, better organised.

The creative type has always been treated as

the ugly duckling of the brood, but the creator of new scientific knowledge now holds the material destiny of the world in the hollow of his hand as completely as his prototype in literature, art, music, or abstract thought dominated the future of its mental and moral destiny, though in neither case does their work mature in their own generation. In his reforming zeal Sir James Barrett would storm their last dug-out. The Royal Society is bidden to say good-bye to the relics of medievalism, and to admit to its membership successful organisers of transport, pioneers in public health improvement, and serious statesmen whose obvious services to mankind are at least the equal of those rendered by the dissection of earthworms, the discovery of a capsule on a bacillus, or recondite investigations into rare elements. The Royal Society, like the universities, no doubt has outgrown its original functions, which are being atrophied in competition with the claims of urgent and more practical affairs. Yet if one could go to sleep for fifty years and wake up, the importance of what is being more and more sacrificed might be seen in truer perspective.

FREDERICK SODDY.

NATURAL SCIENCE AND RELIGION.

The Next Step in Religion: An Essay toward the Coming Renaissance. By Dr. R. W. Sellars. Pp. 228. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1918.) Price 1.50 dollars.

WHAT is to be the religion of the future? How far will traditional beliefs be affected by the view of the universe which modern science sets before us? Such are vitally important questions which in the present volume an American author tries to answer. The man of science takes for his postulate the uniformity of Nature. It has served him well, for upon it the physical and biological sciences have been built. But are man's ethical and æsthetic faculties, which dominate human life, conditioned by inexorable law? Could we, if we knew completely a man's history and environment, predict his every action? The man of science is tempted to answer "Yes," and his creed is, then, extraordinarily like the Stoic determinism to be found, for instance, in Marcus Aurelius. Most of us, however, are certain that we have free-will. As we make the admission, the chains of necessity cease to bind us. We find ourselves forced to make an idealist, or spiritual, interpretation of the universe, and many hold Christianity to be the most persuasive consequential position.

Dr. Sellars, in his book, begins by showing that primitive cosmologies, such as are to be found in the Bible, have been finally discredited. Copernican astronomy and the doctrine of evolution have radically altered the setting of Christianity. Next he shows how the study of comparative religion reveals the genesis of much of the myth and ritual legislation of the Old Testament. He then proceeds to discuss the origins of Christianity. He admits Jesus of Nazareth to have been a historical character, but finds in St. Paul's teaching more affinities with the mystery-religions of the Roman Empire than with the faith of which Jesus made Himself the centre. A rapid sketch of the evolution of Christianity brings us to the conflict of science and religion in modern times. Throughout the earlier chapters of his book Dr. Sellars shows wide, though at times superficial, reading; some of his conclusions authoritative scholars would reject. He later argues against miracles, denies the existence of the soul and of personal immortality, finds the problem of evil a fatal obstacle to the Christian idea of God, and ends with a plea for a religion, purged of supernaturalism, which will mean "the valuing of experiences and activities, the striving for their realisation, the loyalty to their call." An obvious criticism presents itself. If man is a product of natural laws which have made him and which he cannot modify, what is the use of his "striving" and "loyalty"? The laws will work themselves out: man is their creature: the end is determined.

The theologian will say that Dr. Sellars has not got to the kernel of traditional Christianity. He chips off bits of the husk and announces that there is nothing inside. Of certain degenerate types of Protestantism it may be that nothing is left when Bibliolatry has gone. But Christian theology is first of all rational. It is founded upon the belief that we can reach absolute truth and upon a determination to succeed in the quest. Arising out of the attempt to find truth are the spiritual interpretations of the universe made by Jewish prophets and by 800 years of Hellenic speculation which began with Socrates and ended with Plotinus. A synthesis of these blends with Christ's teaching, and is constantly associated with the mystical experience of humanity. Modern natural science has nothing to do with the essentials of this massive structure. It can ignore it all; but, in so doing, it will fail to explain man to himself. Dr. Sellars's "religion" is a set of exhortations empirically derived from his social and political environment. We believe that, because its metaphysical basis is defective, it cannot satisfy men, though it may inspire some to live worthily in a democratically organised society.

E. W. BARNES.

THE PASSING OF THE OLD ORDER.

(1) *The Neo-Platonists: A Study in the History of Hellenism.* By Thomas Whittaker. Second edition, with a Supplement on the Commentaries of Proclus. Pp. xv+318. (Cambridge: At the University Press, 1918.) Price 12*s.* net.

(2) *On Society.* By Frederic Harrison. Pp. xii+444. (London: Macmillan and Co., Ltd., 1918.) Price 12*s.* net.

(3) *The Psychology of Conviction: A Study of Beliefs and Attitudes.* By Prof. J. Jastrow.

Pp. xix+387. (Boston and New York: Houghton Mifflin Co.; London: Constable and Co., Ltd., 1918.) Price 10*s.* 6*d.* net.

THE only motive for grouping together three such varied books, each important, is that they all in a marked way exhibit an interest which connects them with the special circumstances of the present profound change in the old world-order. This remark may seem to have little significance in regard to (1) Mr. Whittaker's valuable study of the Neo-Platonists. It is not implied, however, that the interest, because circumstantial, is therefore ephemeral. His book appeared seventeen years ago, but the present issue of a new and expanded edition is only one instance of the extraordinary interest which the closing era of the ancient philosophy is arousing to-day. It certainly is not idle curiosity or the impulse towards an eclectic historical research which is drawing so many of our profoundest philosophers to study anew with living interest that last effort of the ancient world. Philosophy is seeking new expression; the old formulæ are unsatisfactory; science has given us a new world-view.

(2) Mr. Frederic Harrison's volume "On Society" is a collection of lectures and addresses, none of recent date or new. It is in another sense that their interest is circumstantial. They are offered us now in literary form because they have served their purpose as propaganda. They are the record of a sustained effort, throughout a long life still capable of vigorous expression, to give humanity a new religious ideal.

(3) Prof. Jastrow's study is called forth by the special circumstances which drew America into the world-war. He has sought to estimate the forces of logic and psychology which combined to bring about this great event.

OUR BOOKSHELF.

Who Giveth Us the Victory. By Arthur Mee. Pp. 191. (London: George Allen and Unwin, Ltd., 1918.) Price 5*s.* net.

THIS little book is a vivid expression of optimistic theism. It has a strong *note personnel* and an interesting individuality. It is keenly evolutionist and as keenly religious, seeing in all the long processes of becoming the working out of an increasing purpose. It uses Prof. L. J. Henderson's "Fitness of the Environment" in a modernised argument for design. The building stones of the world were all thought out. Water reveals a teleological secret. "Man came into the world to find his house already furnished, his environment exactly what it should be, the necessities of his existence finding their unfailing response in the conditions established through countless ages past." Evolution is not a chapter of accidents, but the unfolding of a great thought.

Mr. Mee has been particularly successful in his picturesque presentation of some of the wonders of the world—the intricacy, the flux, the adaptiveness, and the gradual emergence of mind which was implicit from the beginning.

The great steps in human evolution are poetically described, and man is regarded as fellow-labourer with the Absolute in continuing the task of Evolution. The kingdom of man as striven for by the wisest—and here the author is nothing if not patriotic—is what St. Augustine discerned. Much waste land has to be reclaimed, many marshes have to be drained, there are still many dragons in England; and part of the noble purpose of the book is to show how the lessons of the war may at once enlighten and encourage man in his great endeavour after a fuller embodiment of his highest and most lasting values.

Mr. Mee says in simple words and with some passion what many great thinkers have said learnedly and with more restraint. His book is timely and on the side of the angels, and though we spell some of the words differently we heartily wish it good speed.

Eastern Exploration, Past and Future: Lectures at the Royal Institution. By Prof. W. M. Flinders Petrie. Pp. vi+118. (London: Constable and Co., Ltd., 1918.) Price 2*s.* 6*d.* net.

THIS collection of lectures forms a useful and timely book. Prof. Flinders Petrie directs attention to the possibilities of archæological investigation under the new conditions which now prevail in Palestine and in Mesopotamia. His experience urges him to utter a much-needed warning against the system which has already led to much loss of valuable material in Egypt and in Cyprus. He describes in a lucid way the problems on which excavation is certain to throw new light, and he marks out the sites which deserve special attention. Beginning with the later historical period, he describes the beautiful remains of the Christian period in Syria, and the painted tombs of Mareshah, which represent Greek art. Going much further back, the great Scythian migration, which made its centre at Beth Shean, in the valley of Jezreel, deserves special investigation. Jerusalem must not be allowed to become a modern commercial town; a new suburb must be built, and the sacred sites protected and laid open to systematic examination.

Prof. Flinders Petrie gives a lucid sketch of Mesopotamian culture, and he pleads the necessity of a special inquiry into ancient Elamite art. But the main burden of his discourse is to emphasise the urgent need that all future excavation shall be restricted to qualified archæologists, working under rigidly scientific rules, and that it shall not be permitted in the case of enthusiastic, but ignorant, amateurs. Traffic in antiquities, which leads to unauthorised digging by natives, should be sternly prohibited. It may be hoped that the administration soon to be established in Palestine and Mesopotamia will take heed of his advice, which will receive the concurrence of all scientific antiquaries.

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. *No notice is taken of anonymous communications.]*

The Effect of Light on Long Ether Waves.

THE curious and important observation made by Mr. Marconi on the basis of experience in long-distance wireless telegraphy exhibits a strange kind of interference between ether waves of very different lengths. The extremely short waves which ionise air interfere with the easy transmission of the long waves which are originated by alternating electric currents, and may conceivably have something to do with the optical opacity of dry haze.

Since many scientific men besides physicists read NATURE, it may be permissible to explain that this is an entirely different effect from the purely localised bands of interference which accompany the superposition of wave motions, and are a matter of simple geometry. In this phenomenon of interference bands there is no destruction, only redistribution, of energy; and there is nothing akin to opacity, whether of the absorbent or the reflective kind. It is, moreover, purely an affair of the ether. Whereas opacity is always an effect brought about by the presence of matter in the path of ether waves, the ions or electrons which are liberated from matter by exceedingly short waves raise a barrier or act as a reflector to extremely long ones. Thus the phenomenon depends on the interaction between free ether and electrified particles immersed in it.

A study of the details of this phenomenon cannot fail to be instructive, and the Radio-telegraphic Committee of the British Association had made preparation for getting facts recorded during the solar eclipse of August, 1914. The war prevented anything being done, but now, as Prof. Fleming—the father of the committee—suggests in NATURE of January 23, another opportunity presents itself in the eclipse of the afternoon of May 29, when the line of totality passes across the South Atlantic from South America to Africa, crossing Ceara, in Brazil, and Princes Island, in the Gulf of Guinea. The astronomers going from this country will have their hands full, but a special group of wireless experts might accompany the expedition if funds were available. It seems probable that assistance might be rendered more readily by the United States than by this country. Prof. Eccles, the secretary of the British Association Wireless Committee, is still too engaged at present with Admiralty work to superintend operations, but the Astronomer Royal has informed him that Dr. Bauer, the head of the Carnegie Institution of Washington, has already made plans for observations on magnetism and atmospheric electricity, and may be planning to take charge of radio-telegraphic observations also. Several months ago Prof. Eccles sent to Dr. Bauer the documents prepared for recording wireless phenomena on the occasion of the previous solar eclipse in 1914, and is again communicating with him. And thus we trust that Prof. Fleming's admirable suggestion will be carried out.

OLIVER J. LODGE,
Chairman of the British Association
February 4. Radio-telegraphic Committee.

The Aggregate Recoil of Radio-active Substances Emitting α-Rays.

THE November (1918) issue of the *Philosophical Magazine* has just reached us, and I have read with great interest the results of some remarkable experiments by Mr. S. Ratner "On Some Properties of the Active Deposit of Radium." The paper in question deals with the spontaneous transference of active matter from the surface of a plate covered with the active deposit of radium to other objects placed near it.

This effect has been repeatedly observed by workers in radio-activity, and has been attributed (1) to a slight volatility of the active deposit at ordinary temperatures, or (2) to the recoil of a compact cluster of atoms of the active matter when one of the atoms contained in it disintegrates with ejection of an α-particle. To this latter phenomenon I recently gave the name of "aggregate recoil."

Mr. Ratner deals with both possibilities, and arrives at the conclusion that neither of them satisfies the requirements of his results. He states that his experiments "have failed to disclose the nature of the phenomenon."

During the last four years I have been engaged at intervals on experiments of a similar kind, performed with the object of explaining the almost inevitable and unavoidable contamination with polonium of electroscopes and ionisation vessels used in experiments with this substance. In 1915 I made mention of this phenomenon in a paper published in the Communications of this institute (No. 80), and suggested the possibility mentioned under (2) above in explanation of it, although I had, unfortunately, overlooked the fact that Makower and Russ had made the same suggestion in 1910 until I read Mr. Ratner's paper yesterday.

My subsequent experiments with polonium, done for the most part in the summer of 1917, lend strong support to the idea of aggregate recoil as the cause of this "wandering" of the active matter. Inasmuch as I obtained quite appreciable effects with polonium, my results disagree with those of Mr. Ratner; in fact, I have not a single observation which is not adequately explicable in this manner. In No. 113 of the Communications of this institute, which was published in July, 1918, I discussed this phenomenon, and examined the part played by the disintegration of the active foil ("spluttering") due to the bombardment of α-particles. It was found that, in general, much less than 1 per cent. of the total effect is due to the latter cause. A further paper on aggregate recoil is at present in the press, and the work is still in progress.

As I am returning home in the course of a few weeks, I hope before long to publish the results of these experiments in the *Philosophical Magazine*, as well as others of a similar nature done last summer with the active deposit of radium. I beg to mention, however, that, in the light of my own work, I am of the opinion that almost all, if not all, of Mr. Ratner's results are in harmony with the recoil of aggregates of atoms of active matter, as originally suggested by Makower and Russ in explanation of the phenomenon in question.

Like Mr. Ratner, I regard the so-called β-recoil of radium-C from radium-B as a theoretical possibility, which it will be impossible to realise in practice. My reasons for the latter conclusion are contained in my July publication. Dr. Lise Meitner, to whom I mentioned my results last summer, informed me that she no longer believes in the practicability of achieving a transference of active matter by β-recoil. She agreed that the idea of aggregate recoil in the manner above suggested is much more in harmony with the experimental results, and she informed me that Prof. Hahn and herself had never been able to obtain pure radium-C by the postulated β-recoil method.

Before closing this letter, I should like to make

mention of the extreme courtesy and kindness shown to me by the Austrian physicists, in particular by Director Prof. Stefan Meyer and Prof. Heinrich Mache, and the other gentlemen associated with this institute, throughout the period of my confinement here since the beginning of the war. They have stood by me through thick and thin, and were never weary in doing what they could to alleviate the strain of life under such unusual conditions. Thanks to their intervention on my behalf, I was given every facility for continuing my research work in the institute, and I have been at all times aided and stimulated in my work by their helpful criticism and encouraging interest.

ROBERT W. LAWSON,
Formerly Pemberton Fellow of the University of Durham.
Vienna Radium Institute, January 5.

Ripple Marks due to High Pressure.

WHILE in London and examining the German guns in the Mall, I came across one with a burst shell in its breech, which is probably a unique curiosity, and possibly of value to geologists and others who are interested in the flow of solids. The shell seems to have burst while being loaded into the gun, and, although it is well opened out, only a small portion is missing. The retained pieces are of interest, for on their inner surfaces they are covered with a large number of small patches of very fine ripple marks. These must have been produced under the intense pressure of the explosion, for it is well known that the insides of shells are turned smooth, polished, and varnished. It is, of course, difficult to say whether a study of these ripple marks will prove of scientific value, but seeing that the gun and its shell are probably exposed to the rain, and as these unique ripple marks may soon corrode away, I should like to suggest that this particular gun and its shell should be protected against further injury by being removed to a geological museum, or, perhaps, to the United Service Institution.

C. E. STROMEYER.
Lancefield, West Didsbury, February 6.

WAR NEUROSES AND "MIRACLE" CURES

IN a London daily paper there appeared recently a dramatic account of a blind Italian soldier suddenly recovering his sight at the door of the church where his bride awaited him. It is not generally known that similar "miracles" occur in this country, and the present writer has been fortunate in witnessing them in considerable number. A brief account of these conditions where the disability is rapidly curable is not without interest, for the war has produced thousands of such cases, and it is a startling fact that many sufferers have been discharged from the Army as "permanently unfit" who might otherwise be doing useful work. To remedy this state of affairs several neurological hospitals have been established, where the study and treatment of war neuroses can be carried out. The recognition that certain disablements are partly or wholly functional is of the greatest importance, for what at first might appear a hopeless condition becomes one that is curable, or, at any rate, can be markedly alleviated. Much original work on this subject has been done by Babinski, in Paris, and by Lt.-Col. Hurst, at Seale Hayne Neurological Hospital, Newton Abbot. Some interesting statistics were recently completed at the latter institution. It was found that the average length of time during which one hundred soldiers had been completely incapacitated owing to disabled legs or arms was eleven months. The average length of time taken to cure ninety-six of these was fifty-four minutes. Of the remaining four, one took one month, two were cured in three weeks, while the fourth required four days before recovery was obtained. The rapidity of the cure was due to the fact that the disabilities were recognised as being not organic, but functional, in character before treatment was carried out.

The origin of a functional disability in a soldier has both a physical and a psychical foundation. Few, if any, cases have been recorded as the result of the fighting in South Africa, 1899–1902. The conditions, however, under which the soldier has fought in the present war have been wholly different.

Trench warfare for prolonged periods under the most adverse climatic conditions, the high explosives causing concussion and burial, profound exhaustion following continued marching and fighting, with all the accompanying revolting sights of war, the strain of responsibility, and the suppression of emotions, are only some of the factors to be borne in mind with regard to the causation of nervous instability. It is worthy of note that there is frequently no history whatever of previous nervous trouble in the soldier who eventually succumbs to the stress and strain of military service. The ordeal through which he has passed tends to make him more impressionable, or suggestible, and symptoms of hysteria are liable to supervene.

At Seale Hayne Hospital the term "hysteria" is used to describe any disability produced by auto- or hetero-suggestion which is curable by psychotherapy, by which is meant the treatment by explanation to the patient as to how the abnormal condition was brought about, and how it can be cured. His confidence must be obtained, and the explanation made simple enough for him to understand. This may be followed up, in certain cases, by re-education of muscles, active and passive movements, and persuasion. This definition will be more readily understood if a few cases, or types of cases, frequently met with are very briefly described.

A soldier sprained his ankle and immediately afterwards was rendered unconscious by the explosion of a shell. On recovering consciousness he found he had lost the power in his legs. The concussion or shock had, for the time, paralysed him, and there may have been some actual damage to his spinal cord. The time came, however, when these organic changes had passed away; but the patient was convinced in his own mind that he was permanently injured, and had given up trying to walk properly. Eight months after the onset of his symptoms the loss of power and the drop foot were recognised as being func-

tional in nature, and he was admitted to Seale Hayne Hospital. The condition was explained to him, the muscles of the leg were re-educated, and, with a little persuasion, he was able to run without noticeable limp in a quarter of an hour's time.

A very important class of case is where the soldier has received a bullet wound in the arm or hand, and months later the whole limb may be found paralysed. The hand may be absolutely flaccid, or the fingers have become stiff and rigid, smooth, blue in colour, and even wasted. It was recognised that the disability was out of proportion to the wound, and it was until recently looked upon by many as the result of reflex irritation.

It has been found, however, that these cases yield surprisingly quickly to psychotherapy. The hysterical, flaccid paralysis occurs where the patient is convinced that he is paralysed and has given up trying to use his muscles. There may have been a temporary loss of power with a splint applied for an unnecessary length of time, or the man may have found at first that he experienced less pain if he kept his limb absolutely motionless.

The spastic paralysis of a hand or arm is frequently explained by the patient contracting both his flexor and extensor muscles at the same time. The more he tries to bend his fingers, the more rigid they become. The cause of the apparent trophic changes is due to the altered blood supply brought about by the lack of movement in the former case, and by the continued spasm in the other. It is of interest to note that a hand thrown completely out of action for a year or more may recover its function after a few minutes' treatment.

Many soldiers have been invalided out of the Army with a high percentage of disability as a result of gas poisoning, though many of these are quickly curable by appropriate treatment.

The commonest symptoms persisting after this injury are loss of voice, blindness, and vomiting. Any one of these conditions may be met with many months after the original onset. When a gas shell explodes, in addition to possible injuries from concussion, the gas is liable to set up inflammation of the larynx, intense irritation of the eyes, and vomiting from the absorption of the poison in the stomach. After three or four weeks these symptoms have in most cases disappeared. When, therefore, many months later, the patient is still whispering, the diagnosis of hysteria should at once be considered.

The man during the acute stage of laryngeal irritation has been unable to speak, and rightly may not have attempted to do so. The frequent examinations and the treatment by inhalations and sprays convince him still further that his condition is a serious one; he eventually loses control over the musculature of his vocal apparatus, and is content to whisper. Here, again, with explanation and persuasion, he recovers his voice in a few minutes. Scores of such cases are on record at Seale Hayne Hospital. In a series of sixty-seven consecutive cases it was found that the average length of time they had been under treatment, before admission there, was 205 days—the maximum being nineteen months, and the minimum two weeks. These were all rapidly and permanently cured, the majority taking only a few minutes' time.

Hysterical blindness, following inflammation of the conjunctivæ, is usually caused by spasm or flaccid paralysis of the muscles of the eyelids, just as in those of the arm after a wound. In this condition, however, the mechanism of accommodation or focussing has also been affected. Dramatic cases of cure have been obtained of this condition, and no doubt the one quoted at the beginning of this article was one of these.

The writer was fortunate in seeing a case treated by Lt.-Col. Hurst and Capt. Gill. The patient in question had been blind since 1914 as the result of an explosion in France. At the end of 1918 a doctor eventually recognised the condition as probably functional in nature, and found that the interior of the eyeball was normal. The pensioner, with all the appearance of the typical street beggar, was led up to hospital. As the result of his four years' blindness his hearing and intelligence had been affected, and he appeared extremely dull-witted. Twenty-four hours later this man was scarcely recognisable, for, with the recovery of his sight, his power of hearing also returned, and he appeared alert and happy. In this case the recovery was not instantaneous, for, owing to the length of time his eyes had been functionless, some hours elapsed before his pupil reflex and accommodation acted normally.

Persistent vomiting after gas poisoning may be explained as a hysterical perpetuation of symptoms, and has been found readily amenable to psychotherapy.

The bent back after burial from explosion, where there are no symptoms of organic disease, although the patient persists in walking like an old man with the aid of two sticks, is a condition not infrequently met with. He is convinced he is unable to stand erect, in spite of the fact that there is no curvature of the spine when he is lying in the recumbent position. If persuasion and explanation fail in bringing about recovery, Lt.-Col. Hurst adopts the plan of making the patient lie upon a board with a foot-piece. This is gradually raised to a right angle, and the patient, who finds himself standing in the erect position—the first time, perhaps, for many months—is told to walk forward. The rapidity of the cure, its apparent simplicity, and the surprise of the patient give rise to a situation not without a certain element of humour.

These are only a few examples of war neuroses. Details of treatment depend upon the individual case, but it may be added that the atmosphere of cure that prevails in a neurological hospital is a most powerful factor in recovery. A disabled soldier, coming in contact with others already cured, becomes more hopeful about his own condition, and is the more likely to derive benefit from the treatment adopted.

The object of this communication is to direct attention to the fact that thousands of soldiers, whose disabilities are curable, have been discharged from the Army. Treatment is necessary to enable the pensioner to return to useful civil employment and to save the State from vast expenditure in unnecessary pensions. A. R.

THE PROPOSED UNIVERSITY FOR THE EAST MIDLANDS.

THE movement for securing a charter for University College, Nottingham, with the view of making the College the seat of a University for the East Midlands, has been carried further forward an important stage. A large conference of representatives of the counties of Derby, Leicester, Lincoln, Northampton, Nottingham, and Rutland was held in the Grand Jury Room of the Guildhall, Nottingham, on Thursday, January 9. The Duke of Portland, who is the president of University College, took the chair, and the meeting included representatives of the leading civic and educational bodies and institutions throughout the whole area.

The population concerned forms a well-marked geographical unity. It is concentrated, roughly speaking, in an ellipse, with its major axis stretching north and south from Mansfield to Northampton, and its minor axis east and west, with Nottingham at the northern focus. The nearness—half an hour by rail—of Derby, Leicester, and Nottingham will render possible the interchange of students and teachers in a specially economical manner. And the remoter centres of population, such as Lincoln and Northampton, are within easy reach of one at least of the cities already named.

For the present, indeed, University College, Nottingham, and the Midland Agricultural College are the only institutions within the area which, in a systematic manner, provide instruction and pursue research of the highest standard. And the centre of the administration of the University will be at Nottingham. But there are in existence or immediately contemplated a considerable number of institutions providing instruction of a special character, which will become integral parts of the new University, ranging through various degrees of affiliation to the position of schools in the University. Schools of engineering, of lace, and of hosiery will, it is expected, take their respective places on a footing like that of the existing Agricultural College. Plans of a more ambitious character, involving the establishment of colleges of pure science and of arts, are also being developed. The proposed University, therefore, will furnish a type of a federal character in so far as the various schools rise towards, and obtain, recognition.

The movement is thus organic to the soil, and is not an adventitious growth. Amid local differences there is a similarity of social conditions and temperament which will bring a high degree of co-operation within reach. This co-operation may already be found in the joint foundation of the Agricultural College, in the East Midland Educational Union, and in the East Midland District of the Workers' Educational Association. But no more hopeful omen for the realisation of the proposed University could have been anticipated than the unanimity with which, on January 9, the large and representative conference first affirmed the principle in view: "The need for a University providing university and advanced technical education, and promoting scientific research" for the East Midland area, and then, in the second place, outlined the committee which should take the next steps required.

With the proposed foundation, the establishment of a University in each province will be nearly complete. And such is the richness of our English tradition, human and material, that the more recent foundations may look forward to gaining some of that atmosphere which lends a magical stimulus to the studies of our two most ancient Universities. Of the local wealth of which the new University should be the guardian, two instances may suffice, one for arts, and one for science. By a happy accident, not so many years ago, the famous Leicester Codex of the New Testament was rescued from obscurity and careless handling, and is now secure in the muniment-room of the Town Clerk of Leicester.

In Nottingham, for the lack of a proper environment, the remarkable mathematical genius of George Green displayed itself partly in vain. His epoch-making essay, "On the Application of Mathematical Analysis to the Theories of Electricity and Magnetism," was published in Nottingham in 1828 by subscription. In the preface the youthful author expressed the hope that "the difficulty of the subject will incline mathematicians to read this work with indulgence, more particularly when they are informed that it was written by a young man, who has been obliged to obtain the little knowledge that he possesses at such intervals and by such means as other indispensable avocations, which offer but few opportunities of mental improvement, afforded." The hope was vain. To quote the ninth edition of the "Encyclopædia Britannica": "The work of Green, which contained these fine researches, though published in 1828, escaped the notice not only of foreign, but also even of British, mathematicians; and it is a singular fact in the history of science that all his general theorems were rediscovered by Sir William Thomson, Chasles, and Sturm and Gauss." Some years ago, at the instance of my colleague, Prof. E. H. Barton (to whom, himself a local mathematician, the University College is proud to have furnished the opportunities which Green lacked), I gathered from Miss Green some interesting particulars about her distinguished father; and these particulars were forwarded to Sir Joseph Larmor. I cannot imagine a more impressive argument for the foundation of the new University than a careful consideration of the biography of George Green. The traveller to Nottingham from the south can

rest his glance on the lower part of a windmill still known as Green's Mill. This belonged to the father of the mathematician. The neighbours still hand on the tradition that the youthful genius worked within the walls of this building.

FRANK GRANGER.

NOTES.

THE KING opened the new Parliament in person on Tuesday, February 11. In his Speech reference was made to proposals to be brought forward for the promotion of a comprehensive scheme of afforestation and to "a Bill for the creation of a new Ministry to deal with public health, with a view to the establishment throughout the land of a scientific and enlightened health organisation to combat disease and to conserve the vigour of the race."

WE deeply regret to announce the death on February 9, in his eighty-fourth year, of Prof. G. Carey Foster, F.R.S., formerly principal of University College, London, and previously professor of physics there from 1865 to 1898. The funeral will be at Rickmansworth Cemetery to-morrow (Friday) at 3.15.

SIR RICHARD THRELFALL, formerly professor of physics in the University of Sydney, has been elected a member of the Athenæum Club under the provisions of the rule of the club which empowers the annual election by the committee of a certain number of persons "of distinguished eminence in science, literature, the arts, or for public service."

SIR RONALD ROSS, who is consultant in malaria to the War Office, has been appointed honorary consultant in malaria cases to the Ministry of Pensions.

WE regret to see the announcement of the death, at sixty-two years of age, of Prof. R. A. E. Blanchard, professor of parasitology in the faculty of medicine, University of Paris, and author of numerous contributions to zoology, physiology, comparative anatomy, and hygiene, in addition to his works on parasites and parasitic diseases.

THE death is announced, in his sixty-seventh year, of Dr. Rolla C. Carpenter, who occupied a chair of engineering at Cornell University from 1895 to 1917. Dr. Carpenter had been concerned at various times in important engineering enterprises of the cities of Baltimore, Brooklyn, and New York. In 1898 he was president of the American Society of Heating and Ventilating Engineers. He was the author of treatises on experimental engineering, heating and ventilation, and the gas-engine.

NEXT Tuesday, February 18, Capt. G. P. Thomson will give the first of two lectures at the Royal Institution on "Aeroplanes and the Great War." On Thursday, February 20, Prof. H. M. Lefroy will give the first of two lectures on "Insect Enemies of our Food Supplies"; and the second on Thursday, February 27, on "How Silk is Grown and Made." The Friday evening discourse on February 21 will be delivered by Mr. A. T. Hare on "Clock Escapements"; and on February 28 by Prof. J. A. McClelland on "Nuclei and Ions." On Saturday, February 22, at 3 o'clock, the Hon. J. W. Fortescue will give the first of two lectures on "The Empire's Share in England's Wars."

DURING the war the interests of patentees have been adversely affected, and probably none more so than those connected with the chemical industries. Many patentees have been unable to use or develop their patents, whilst in some cases where patents have been granted the mere publication of the grant has been forbidden. Attention is directed to these facts in the *Chemical Trade Journal* of January 25. Representations have already been made to the Controllers of Patents and of Munitions Inventions, but it is suggested that further co-ordinated action is desirable to get the position readjusted. Inasmuch as many holders of British patents have, in the national interest, freely allowed the use of their patents for the period of the war, it is claimed that the "life" of those patents should be extended correspondingly.

WE regret to learn from the *Journal des Observateurs* (vol. ii., No. 12) that M. Jérôme Coggia died on January 15. M. Coggia was born in 1849, and was assistant at Marseilles Observatory for more than fifty years. His colleagues there refer to him as "un astronome actif, habile et consciencieux, et un homme de cœur." He is best known for his discovery of the brilliant comet 1874 III., but he also discovered seven other comets and six minor planets. Another discoverer of a remarkable comet has passed away in the person of Mr. Edwin Holmes, a prominent member of the British Astronomical Association and a regular attendant at its meetings. The comet of short period that he found in November, 1892, was distinguished by two brilliant outbursts, after each of which it expanded rapidly and became difficult to see. It has been re-observed at two out of the three returns that it has made since then, but has never repeated its interesting behaviour of 1892.

THE deaths of the following engineers are announced in the *Engineer* and in *Engineering* for February 7:—Mr. Thomas Wright, late general works manager of the Dowson-Mason Gas Plant Co. He had been recognised for many years as an expert in the construction of coal- and gas-fired furnaces, and was a member of the Institution of Civil Engineers, the Institution of Mechanical Engineers, the Iron and Steel Institute, and the Faraday Society.—Mr. Edward Cecil Ingleby, who died on January 24 after a long illness, was a director of the firm of Ingleby and Co., Ltd., electrical engineers, and an associate member of the Institution of Civil Engineers.—Mr. George Cuming, who was in his forty-eighth year, and for thirty-two years had been connected with the firm of Messrs. Harland and Wolff, Belfast, latterly as engineering manager. He was a member of the Institution of Mechanical Engineers, and also of the Institution of Naval Architects, and was made an officer of the Order of the British Empire in 1917. He took an important part in the development of the steam turbine for steamship propulsion.

DESIGNERS of motor-cycles have for some time past felt that no adequate means exist to admit of their meeting together for the purpose of ventilating and discussing the difficulties of the many problems with which they are confronted from time to time. In consequence, a representation on the subject was recently placed before the Institution of Automobile Engineers at a conference attended by technical representatives of some of the motor-cycle manufacturing firms. The institution has now arranged for two meetings to be held at the Birmingham Chamber of Commerce expressly for the discussion of points connected with the design of motor-cycles. The first of these meetings will be held on Thursday, February 20, when Mr. D. S. Heather will read a paper entitled "A Survey of Current Motor-cycle Design"; and the second meeting will be held on Thursday, March 20, when Mr. Eric Caudwell will read a paper the title of which is not yet announced. Those who desire to

be present at these meetings are invited to communicate with the secretary of the institution, 28 Victoria Street, Westminster, S.W.1.

INFLUENZA is now epidemic in Australia, is spreading in Victoria and South Australia, and is attended with a considerable mortality. In South Africa influenza is stated to have caused the death of 11,736 Europeans and 127,000 "coloured" and natives. With regard to the nature of the virus of influenza, it has been surmised of late that the influenza bacillus of Pfeiffer may not be the causative organism, but that an excessively minute, "filterable" micro-organism may be present, and evidence in favour of this view has been brought forward by Major-Gen. Sir J. Rose Bradford and Capts. E. F. Bashford and J. A. Wilson (*Lancet*, February 1, 1919, p. 169). They found present minute, rounded, coccus-like bodies measuring 0·15μ to 0·5μ in diameter, Gram positive, anaerobic, resisting heating to 56° C. for thirty minutes, and passing through Berkefeld N and V filters and a Massen porcelain filter. The organisms have been isolated from the blood, sputum, and pleural fluid, and obtained in cultivation (method not stated). The cultures inoculated into animals produce illness in guinea-pigs and monkeys with pneumonia and hæmorrhages. Similar experiments have been carried out with trench fever and nephritis, and organisms of the same type have been isolated in these diseases, cultures of which on inoculation produce respectively trench fever and nephritis. In the case of trench fever, the same organism was isolated from infected lice.

WE have received the first annual report of the Industrial Reconstruction Council, a purely educational corporation, with Sir Wilfrid Stokes as president and Mr. Ernest J. P. Benn as chairman. Prof. W. Ripper, Vice-Chancellor of the University of Sheffield, is treasurer and Prof. A. W. Kirkaldy, of Birmingham, a member of the executive, so that education of university grade is well represented. The object of the council, which was established in December, 1917, is to contribute to the solution of the problem of labour unrest by supplying information on industrial economics alike to employers and employed by means of lectures, conferences, and the distribution of printed matter, and, in particular, to make widely known the proposals of the Whitley Committee with reference to the self-government of industry by means of industrial councils and interim committees, and to urge the organisation of all trades, both employers and employed, so as to make the formation of industrial councils possible. To this end the council has held public meetings in the largest cities, and sent lecturers to address trade and other societies in more than forty centres. Some of the larger gatherings have been addressed by the Minister of Reconstruction, the Minister of Labour, the President of the Board of Trade, and the chairman of the Department of Scientific and Industrial Research. Since last September fortnightly lectures have been given on Wednesday afternoons in Saddlers' Hall, kindly lent by the Saddlers' Company, and fortnightly conferences have been held on Tuesday evenings in the hall of the Institute of Journalists. Sixty thousand copies of the council's pamphlet on "Trade Parliaments" have been distributed, besides much other literature. The offices of the council are at 2 Tudor Street, E.C.4.

THE Lieutenant-Governor of Bengal, in unveiling a bust of Sir Leonard Rogers at the Calcutta School of Tropical Medicine, paid a generous tribute to the work performed by that eminent physiologist. To him is due the successful treatment of the disease known as kala-azar, long a scourge in the Assam Valley. In connection with this investigation, he initiated a new treatment for dysentery, and discovered a vaccine used in cases of sprue. Sir Leonard Rogers's industry in these researches was immense. Besides important books, he has published more than 150 scientific papers, and he has never hesitated to announce to the world the results of his labours. To Sir Leonard Rogers the Calcutta School of Tropical Medicine owes its establishment, and no place could be more appropriate for the location of the bust of a scientific worker who has made important discoveries leading to the mitigation of various forms of disease.

IN a review on the subject of alcohol, based upon the report of the Central Control Board, Dean Wace records his personal impressions. He says:—"For some years I was engaged in writing leading articles at night, and when I returned home, between three and four o'clock in the morning, my brain was too excited for sleep; but a crust of bread and a little claret would give me prolonged and refreshing repose. My experience, in fact, in a hard-working life which has now extended to eighty-two years, has been that alcohol is bad to work upon, but invaluable to rest upon. It has enabled me, indeed, sometimes to do literary work at night after being engaged a great part of the day on the duties of my profession; but only on condition of my interposing a sort of semi-night between the two employments, by two or three hours' rest after dinner, with a good nap. There may be many modifications of this kind in the use of alcoholic drinks; but they are always mere variations of the principle which, after the verdict of this scientific jury, may now be taken to be firmly established—that the chief effect and use of alcohol is to promote rest, and the reinvigoration which rest brings" (*Quarterly Review*, No. 458, January, p. 63).

IN the issue of *Scientia* for September, 1918, Prof. Fraser Harris publishes an interesting paper directing attention to the functional inertia and momentum of living matter. By this Prof. Harris understands those properties in virtue of which the effect of a stimulus is not at once manifested, nor does the result cease immediately on cessation of the stimulus. The statement applies in a certain sense to all matter, and the key is doubtless, as the author points out, the inertia of the carbon atom. But it seems doubtful whether it is justifiable, or even illuminating, to place this property as an antagonist to that of excitability or the capacity of responding to the action of an external force. There seems to be a suggestion of the ancient confusion of thought in which inertia is regarded as a force. The manifestations of it, however, play an important part in physiological phenomena.

INTERESTING "Notes on Myriapoda," by Hilda and Graham Brade-Birks, furnish the Dartford Naturalists' Field Club with an occasional paper "reprinted from the *Lancashire and Cheshire Naturalist*, September and October, 1918." The authors assign to Kent twelve species of Chilopoda, of which four are luminous, and eight species of Diplopoda. Their notes on synonymy would have been more serviceable had they appended dates to the genera and species instead of relegating them to the concluding bibliography. There, too, the "Systema Naturæ" (printed "Systema Natura") is undated, as though there were only one edition of that famous work. In these days of expensive printing the enumeration of ever so many places where specimens have been captured could well have been spared, and the space devoted to concise definitions of the various items of classification. This would probably have been an easy task to these capable writers, and would have gone far to "prove an incen-

tive to further faunistic work in the neighbourhood" in accordance with their express desire. Their list of authorities omits Leach's article in the "Edinburgh Encyclopædia," vol. vii., which carries the date of his *Cryptops hortensis* and his *Lithobius variegatus* back to 1813 alike for each genus and species.

THE Egyptian Government has recently published a useful booklet to supplement its circulars issued in connection with the administration of the law for the protection of birds beneficial to agriculture. This has been prepared by Capt. Flower and Mr. M. J. Nicoll, the director and assistant director of the Zoological Service. It treats of the principal birds protected, and gives their English, French, Arabic, and scientific names, their local status, and their size and coloration. In eight helpful coloured plates are depicted twenty-four of the forty species dealt with. Measures for the protection of these birds are especially necessary in Egypt on account of the ravages of hosts of insect pests, the chief natural enemies of which, the insectivorous birds, are, unfortunately, correspondingly scarce. To afford this protection a law was promulgated in 1912, and circulars have since been widely distributed giving, in various languages, the names of the scheduled species, forbidding their destruction, capture, sale, etc., and intimating the penalties to be inflicted upon those who contravene the Act. That these measures have met with considerable success as regards some species is well indicated in the case of the buff-backed heron, which is a great destroyer of locusts and other noxious insects. This bird had, previous to the protecting law, become reduced to a single colony; now it has greatly increased in numbers, and is to be found in many parts of the Delta. It is to be regretted, however, that the law has not been strictly observed as regards the smaller insectivorous birds. This seems to be, to a considerable degree, due to the fact that the permission granted under licences for the killing and capture of unprotected birds has been frequently misapplied for the destruction of protected species. These illegally acquired birds, after being denuded of their feathers, to render their identification difficult or impossible, are often exposed for sale. The final paragraph of the introduction to this interesting booklet is devoted to an earnest appeal to all who have the welfare of agriculture at heart to make every effort to protect the scheduled birds in the interests of the staple industry of the country.

MR. C. RAUNKIÄR (*Botanisk Tidsskrift*, 36 Bind, 3 Hefte, 1918) describes some experiments to determine to what degree the time of leafing is a constant character in the beech. In the case of marked individual trees, the relative periods of leafing proved to be constant in three successive seasons. Fruits of these trees were collected and sown, under uniform conditions, in the botanic garden at Copenhagen, and the tables of results show a striking correspondence between the mother and descendants with regard to leaf-time, and indicate that early or late leaf-time in the cases in question is genotypically determined. On the hypothesis that the genotypic basis of, for instance, very early leaf-time is a single factor, and either dominant or recessive, the author concludes that it is probably most reasonable to assume that the mother-plant is heterozygous with regard to the factor for leaf-time, and in that case very early leaf-time must be dominant. But it is scarcely likely, the author suggests, that the matter is so simple, and leaf-time is probably, in each individual case, conditioned by a complicated combination of genotypic factors, which at one time can operate in the same direction, and at another may counteract each other. The experiments show that there are not only early and normal beeches, but also a series that varies with regard to leaf-time from very early to very late. The most important point is that *Fagus sylvatica* comprises sub-species, isoreagents, that differ with regard to leaf-time.

THE value of quinine in combating malaria and other tropical fevers makes it most important that the Empire should be sure of adequate supplies of cinchona bark, from which the drug is obtained. An article on the future of the trade in cinchona bark in the Bulletin of the Imperial Institute (vol. xvi., No. 3) directs attention to a somewhat unsatisfactory state of affairs. It appears that for some years past the Dutch East Indies, and particularly Java, have had almost a monopoly in the production. In the years 1911–13 the average annual production of cinchona bark in Java was 22,880,000 lb. out of the world's total production of about 25,000,000 lb. In India, where the area under cinchona fluctuates a little, but, on the whole, decreases, the annual production is about 2,000,000 lb. Ceylon, which some thirty years ago had an annual output of more than 13,000,000 lb., has now practically ceased to be a producer. Eighty per cent. of the world's supply of this bark now finds its way to market at Amsterdam. The article contains many statistics relating to the trade in quinine. It is enough to mention that India's annual consumption of quinine is about 145,000 lb., of which about half is produced in the country and half imported. The home production of bark is inadequate to meet the demand for quinine in India. It would thus appear that a great part of the Empire's supply of quinine has to be imported from foreign countries. This shows the need for extending the cultivation of the cinchona tree under conditions which result in a maximum yield of quinine in the bark. The article concludes with some notes on experiments in this direction in St. Helena and (German) East Africa.

THE Journal of the Scottish Meteorological Society, with its tables for the year 1917, contains two or three communications of especial interest to meteorologists. "The Upper Air: Some Impressions Gained by Flying" is dealt with by Capt. C. K. M. Douglas, and forms the subject of an article in our pages this week. "Ground-Ice" is the subject of a communication by Dr. John Aitken. The paper is somewhat controversial, and deals chiefly with a communication by Mr. A. Watt on the same subject printed in a previous issue of the Journal. "The Climate and Meteorology of Antarctic and Sub-Antarctic Regions" is abridged from an address given by Mr. R. C. Mossman by request of the councils of the Royal Society of Edinburgh and of the Scottish Meteorological Society. The author states that our knowledge of Antarctic regions is limited chiefly to observations during the last twenty years, whilst prior to this our knowledge was confined exclusively to observations derived from summer voyages. With reference to the general circulation of the atmosphere, it is shown that easterly winds are commonly experienced in sub-polar regions associated with travelling cyclonic areas situated to the northward. In this connection reference is made to the National Antarctic Expedition, 1901–4, and to the daily synchronous charts throughout the four years drawn from the observations of the expedition augmented from other sources. Upper-air observations made with kites and balloons are said to be scanty, and most of the facts available are from the movements of high clouds. Pilot-balloon ascents, however, have at times shown that the stratosphere was as low as 4½ miles.

LIGHT-FILTERS made of a new yellow dye have just been introduced by the Eastman Kodak Co. Picric acid being too unstable (filters made with it turn brown), and a more sharply cut absorption being sometimes desirable than that given by "filter yellow," Messrs. Mees and Clarke sought for a dye that would fulfil the desired conditions. They found that glucosephenylosazone gives almost as good absorption of the ultra-violet as "filter yellow," as well as a sharper cut on the other side of the band, and is satisfactorily stable. The actual derivative used, the osazone itself being insoluble in water, is the sodium salt of glucosephenylosazoneparacarboxylic acid, and for convenience they call it "Eastman yellow." The filters are made of three densities, one specially for aerial photography, and this has been adopted by the American forces. Further details with absorption curves are given in the *British Journal of Photography* for January 31.

AN article on metric measurements appears in the January issue of *Cheap Steam*, a periodical issued by the well-known engineers, Messrs. Ed. Bennis and Co., Ltd. From the point of view of the writer of the article, the greatest advantage to be derived from the adoption of the metric system is the enabling of manufacturers to compete on more equal terms with foreign rivals in the world's markets. Inability or unwillingness of the British manufacturer to estimate for overseas clients in terms which they understand has lost many a contract to this country. One secret of Germany's rapid progress as a foreign trader was the promptitude with which she adapted her business methods to the habits and customs of the various nations with which she was anxious to deal, and she never annoyed and puzzled possible customers abroad by quoting quantities and prices in terms which they did not understand. In 1864 an Act was passed to render permissive the use of the metric system; in 1897 another Act was passed making the use of the system optional. The time is now ripe for making it compulsory.

THE influence of the state of the atmosphere on the level of the sea has been very variously estimated, particularly as regards the relative importance of barometric pressure and wind. At one of the recent British Association geophysical discussions Col. Sir C. F. Close reviewed the subject, and described certain new data obtained by the Ordnance Survey (*Geographical Journal*, July, 1918). These showed that at the observation points chosen, on the coast of the Atlantic Ocean and the North Sea, the sea-level responds almost immediately to barometric variations. A rise or fall in the height of the mercury is associated with a fall or rise of sea-level of 13·5 times the amount (equivalent to the variation in a water-barometer). Changes of level due to winds cause some fluctuation in individual estimates of the ratio (from 7 to 20, roughly), but not sufficiently to mask the close connection between sea-level and barometric pressure. In a narrow, land-locked sea, however, it might be expected that the wind would have relatively greater influence, and this is confirmed by a recent study of the Baltic sea-level by Rolf Witting (*Öfv. af Finska Vet.-Soc. Förh.*, vol. lix., A, 13, Helsingfors, 1917). The purely hydrostatic effect of a gradient of barometric pressure over any region is to produce an opposite slope of the sea-surface. But such a distribution of atmospheric pressure is usually accompanied by winds directed along the isobars, with the higher pressure on the left (in the northern hemisphere). This tends to heap up the waters with a gradient perpendicular to the former one, and in the Baltic this slope appears to be about 1·8 times as great as the hydrostatic slope. The resultant gradient is rather more than twice the latter, and is inclined to it in azimuth at about 55°.

THE largest plate-rolling mill in the world is described in an illustrated article in *Engineering* for January 24. This mill belongs to the Lukens Steel Co., of Coatesville, Pennsylvania. It is a four-high reversing type mill, 17 ft. wide on the rolls, and is capable of rolling plates up to 16 ft. in width, and circular plates a few inches wider. It is built on the principle of the two-high reversing plate-stand used in the British Isles, with the modification that the two finishing rolls are backed by two large supporting rolls. The latter rolls stiffen the mill and prevent springing of the operating rolls when rolling wide, thin plates, thus ensuring uniform thickness in the finished product. There are two 34 in. diameter by 204 in. working-face operating rolls of chilled iron with 27-in. necks, weighing about thirty tons each, and two 50 in. diameter backing rolls of cast-steel with 36-in. necks, weighing about sixty tons each. The mill stands about 40 ft. from the top of the screw-cover to the bottom of the shoes. The screw-down rig is of the well-known worm and worm-wheel design, and is driven by two 150-h.p. motors, one on each housing. The mill is driven by a twin tandem compound engine, having cylinders of 46 in. and 70 in. diameter by 60 in. stroke, and is fitted with a jack-shaft and a gear ratio of one to two, which renders it capable of giving an enormous torque. Mechanical tables are provided so arranged as to do away with hand-labour wherever possible.

MESSRS. LONGMANS AND CO.'s new list of announcements contains many books of scientific interest, some of which have already been referred to in these columns. Others are:—"Applied Aero-dynamics," L. Bairstow, illustrated; "Aeroplane Structures," A. J. S. Pippard and Capt. L. Pritchard, with a preface by L. Bairstow, illustrated; "Corrosion and Decay of Metals," Prof. C. H. Desch; "Lead and its Compounds," Dr. J. A. Smythe; "Boiler Chemistry," J. H. Paul; "The Rare Earth Metals," Dr. J. F. Spencer; "Chemical Affinity and Chemical Equilibrium," Dr. H. S. Taylor; a new edition of "Osmotic Pressure," Prof. A. Findlay; "Ships' Boats: Their Qualities, Construction, Equipment, and Launching Appliances," E. W. Blocksidge; and "Efficient Boiler Management, with Notes on the Firing of Coal-fired Reheating Furnaces," C. F. Wade. Messrs. Longmans also have in hand the third edition of "British Birds," A. Thorburn, illustrated, the first two volumes of which have been published. Vol. iii. is promised for March, and vol. iv. for April.

MR. F. EDWARDS, 83 High Street, Marylebone, W.1, has just published Catalogue No. 386 of books, manuscripts, and engravings relating to India and Ceylon. It contains many rare works and a number of books of scientific interest, *e.g.* a complete set of the "Catalogue of the Birds in the British Museum," 27 vols.; Hooker's "Illustrations of Himalayan Plants"; Capt. W. V. Legge's "History of the Birds of Ceylon"; and vols. i. to v. of Moore's "Lepidoptera Indica." Mr. Edwards has also for disposal the Sanskrit library of the late Col. G. A. Jacob, comprising about 700 vols.

MESSRS. DULAU AND CO., LTD., have just issued from their new address (34 Margaret Street, Cavendish Square, W.1) Catalogue No. 74 of some 1200 books on botany, agriculture, and zoology which they have for disposal. It gives particulars of many rare editions of works dealing with the subjects referred to, and should be of service to many readers of NATURE. A feature of the catalogue is many of the earlier volumes of the British Museum Zoological Catalogues and Lists.

OUR ASTRONOMICAL COLUMN.

THE PULSATION THEORY OF CEPHEID VARIABILITY.—The Monthly Notices for November last contain a paper on this subject by Prof. Eddington, who selects fourteen Cepheids, the light-curves of which are well known, to test the theory. The absolute magnitudes are deduced from the periods, using a diagram given by Mr. Shapley, and the effective temperatures and densities from a former paper of his own. Prof. Eddington finds that all the stars are in a gaseous state throughout their volume except the two of lowest absolute magnitude; he connects this with the fact that Mr. Shapley's diagram shows a linear relation between period and magnitude for the brighter stars, but a curve for the fainter ones. The radius of Y Ophiuchi, the brightest star on the list (abs. mag. −4), is given as 42,000,000 km., the mass being thirteen times the sun's; on the average, the semi-amplitude of the pulsation is 1/13 of the radius. Assuming an effective temperature proportional to the fourth root of the luminosity, the semi-amplitude of the temperature fluctuation is 1/12 of the whole. Prof. Eddington also deduces that with period 4·5 days should correspond spectral type F8½, and with period 30·8 days type G3½. These deductions are in fair accordance with Mr. Shapley's latest observational results.

Prof. Eddington directs attention to an erratum in his former paper on the radiative equilibrium of the stars, the radiation pressure being taken at four times its true value. The error may be corrected by multiplying the adopted molecular weight by 2·8. It will, however, make the calculated duration of the Giant stage even shorter than before.

CALCIUM CLOUDS IN THE MILKY WAY.—The February *Observatory* contains a letter on this subject by Mr. J. Evershed. The suggestion was first made in the case of δ Orionis that it was surrounded by such clouds, since the H and K lines did not share in the orbital motion. Mr. Evershed now shows that the same is the case in Nova Aquilæ, Nova Persei, and Nova Geminorum (2), and quotes five other stars in Aquila, Scorpio, Perseus, and Orion showing the same phenomenon. In all cases the radial motion indicated by the H, K lines agrees within some 4 km./sec. with that due to the sun's motion (assumed 20 km./sec., towards 18h., +30°). Hence the calcium clouds would appear to be practically at rest with respect to the star system, the attraction of the stars upon them being, perhaps, nearly balanced by radiation pressure. It will be remembered that the Orion nebula also appears to have no line-of-sight velocity other than that due to the solar motion.

Mr. Evershed notes that the phenomenon is rendered easier of detection in novæ owing to the large displacement of the H line in the star's own spectrum, which separates it from that due to the cosmic cloud. The latter is seen as a fine absorption line on the broad bright hydrogen band H_ϵ of the nova's spectrum.

A "NEW NAVIGATION" METHOD.—In "Notes on the Working of the 'New Navigation'" (Cairo: Government Press, 1918), Dr. John Ball gives a convenient method of calculating altitude from hour-angle (h), latitude (l), and declination (d). First find an auxiliary angle M from the equation

$$\cos^2 \mathrm{M} = \cos^2 \frac{h}{2} \cos l \cos d.$$

Then

$$\sin^2 \frac{\mathrm{Z.D.}}{2} = \sin\left(\mathrm{M} + \frac{l \pm d}{2}\right) \sin\left(\mathrm{M} - \frac{l \pm d}{2}\right).$$

Use upper sign for l, d *same* name, lower for *contrary* name. Dr. Ball points out the advantages of the method both for navigation and land-surveying. He might, however, have alluded to the very useful "Altitude Tables" of his namesake, the Rev. F. Ball, R.N. (London: J. D. Potter), which give the altitude, without calculation, for every degree of l, d, h to an accuracy of 0·1′ (nearly).

THE WORK OF THE GOVERNMENT LABORATORY.

FROM the recently issued annual report of the Government Chemist on the work of the Government Laboratory (Cd. 9205), it appears that the total number of samples examined during the year 1917–18 was 200,453.

Work for several new departments, including the Air Board, the Ministry of Food, and the Coal Controller's establishment, was undertaken during the year. The aggregate number of samples analysed, however, was some 58,000 less than in the preceding twelve months. This decrease is attributed chiefly to a falling-off in the work required for the Customs and Excise Department. Following upon diminished imports, fewer samples of imported goods were taken for analysis; and war-time restrictions affecting the home consumption of wines and spirits similarly caused a reduction in the amount of analytical work required.

On the other hand, much of the laboratory activity has been devoted to matters arising directly out of war conditions. Among points of special interest may be noted the analytical control over the quality of foodstuffs and medical supplies for the fighting forces, and over the composition of metals employed in naval and aerial constructional work.

More than 20,000 samples of foodstuffs were examined in connection with the feeding of the Expeditionary Forces. This work was carried out partly at the chief laboratory, and partly by officers of the laboratory stationed at the various supply bases. The quality of the supplies was controlled by first examining samples tendered by contractors, in order to ascertain whether the conditions of the specifications were complied with. Specimens of the foods actually delivered were afterwards analysed, to ensure that the deliveries compared satisfactorily with the selected "tender" samples. Most of the analyses were made on specimens taken from contractors' deliveries in course of transit to the Forces, the goods being detained until the report upon their quality had been received by the Army authorities. A salutary check was thus in operation against any tendency to unfair dealing.

The scientific public, and also the general public, would no doubt be interested in knowing whether any adulterations or other attempted impositions were discovered, but on this point the report of the Government Chemist is silent. Still, it may safely be assumed that the systematic examination of supplies would in any case be a strong deterrent against attempts to substitute inferior articles. It may be taken for granted, therefore, that the laboratory control has both conduced to the efficiency of the fighting forces and effected economy of public money.

For the Army Medical Department 960 samples of medicinal articles were examined. As might be expected, these consisted largely of anæsthetics. It is scarcely necessary to point out that the comfort, and often the life, of wounded soldiers under anæsthesia

would depend upon the quality of the anæsthetic substance used; and it is good to know that steps were taken by systematic chemical analyses to ensure the provision of satisfactory supplies. The remainder of the medical articles examined consisted of phenacetin, "aspirin," and miscellaneous products such as quinine preparations and alkaloids for hypodermal injection or ophthalmic uses.

The constructional activities of our naval and aerial Services are reflected in the report by the remark that 8921 samples examined for the Admiralty consisted largely of metals analysed for the Engineering Department, whilst from the Air Board more than a thousand specimens were sent—chiefly alloys. A sample of a so-called substitute for platinum examined for the Ministry of Munitions proved to be an alloy of nickel, chromium, and tungsten.

In connection with contraband trading, numerous questions were submitted to the laboratory by the War Trade Department, the Foreign Office, the Treasury Solicitor, and the Admiralty Marshal. For the two last-named officials 396 samples were analysed in connection with materials seized as prize, or which were the subject of Prize Court proceedings. They included such varied substances as thorium nitrate (used in making gas mantles), oils, colours, resins, drugs, and soap.

Space does not allow of more than a passing reference to the analyses made for the Board of Agriculture, Home Office, Post Office, Board of Trade, and other Departments. The report shows that a large amount of chemical work, having prime importance for Government administrative requirements, has been accomplished during the period in question.

MAGNETIC OBSERVATIONS DURING A SOLAR ECLIPSE.

THE September issue of *Terrestrial Magnetism and Atmospheric Electricity* is mainly devoted to magnetic observations taken during the total solar eclipse of June 8, 1918. Dr. Bauer, the head of the magnetic department of the Carnegie Institution of Washington, has interested himself in similar work during previous eclipses, and in March, 1918, he issued an appeal for co-operative effort on the occasion of the June eclipse. As a result, observations were taken at a number of stations. Seven of these, in different parts of the United States, were within the belt of totality. There were, besides, eight special field stations in the United States and Canada outside the belt of totality, while observations were taken at twelve ordinary observatories. Dr. Bauer himself observed at Corona, Colorado, a station 11,800 ft. above sea-level.

The general scheme recommended included, in the case of eye readings, observations at one-minute intervals during six consecutive hours, the interval being reduced to thirty seconds at stations within the belt of totality from ten minutes before to ten minutes after totality. In the tables of observational results included single readings are not given, but five-minute means are given for declination at the field stations of the Carnegie Institution. Similar declination data for the field stations of the United States Coast and Geodetic Survey are given in a separate communication by Mr. D. L. Hazard, who also includes readings from the declination, horizontal force, and vertical force curves of the five Coast and Geodetic magnetic observatories. Sir Frederick Stupart deals in another communication with results from Agincourt and Meanook, the two magnetic observatories of the Canadian Meteorological Service, and corresponding results from the magnetic observatory at Antipolo, Manila, are contributed by the magnetic observer of the Weather Bureau.

A number of the declination results before, during, and after the eclipse are shown graphically on p. 110, forming part of the discussion of the phenomena by Messrs. Bauer, Fisk, and Mauchly. The conclusion of their discussion will presumably appear in the next issue of the journal. The day, though comparatively quiet magnetically, was by no means free from irregular movements. Also North American stations are naturally more disturbed than European stations in the same latitude. Thus the task before Messrs. Bauer, Fisk, and Mauchly of disentangling any eclipse effect from other disturbing effects is scarcely likely to be easy. Observations taken during previous eclipses have shown that the eclipse effect, if there is one, is not large. Thus, unless some trait can be recognised as common to a number of eclipses, it will be difficult to reach any positive conclusion. This doubtless explains why the Department of Terrestrial Magnetism, not content with what has been done during 1918, has already arranged to send two expeditions to places favourable for observations during the ensuing solar eclipse on May 29 next. Those organising similar expeditions are requested to communicate with Dr. Bauer.

Amongst the other contents of the volume there is an interesting comparison by Mr. W. E. W. Jackson of the magnetic declination results obtained during 1917 at Agincourt (Toronto) and the new magnetic observatory at Meanook, Alberta (54° 37′ N., 113° 21′ W.). As might be expected from its geographical position, Meanook is a much more disturbed station than Agincourt. Also, as is common with North American stations, it is much more disturbed than European stations in similar latitudes. The mean absolute diurnal variation was 22·6′ even in December, and 78·6′ in August. The regular diurnal variation is analysed by Mr. Jackson in Fourier waves. The wave of twenty-four-hour period is found to have a considerably greater relative importance at Meanook than at Agincourt. The station possesses, in fact, characteristics that recent Antarctic expeditions have shown to exist in high magnetic latitudes. Apparently as yet only declination is recorded at Meanook. It is scarcely necessary to say that the addition of horizontal force and vertical force magnetographs at a station presenting such interesting features is much to be desired. C. CHREE.

METEOROLOGY AND AVIATION.[1]

THE future development of meteorology will almost certainly be closely associated with that of commercial aviation. On one hand, an accurate knowledge of the conditions of wind and weather over a wide area for at least twelve hours in advance will be essential to aerial navigation; while, on the other, aeroplanes provide a means of obtaining information of great value to meteorologists, particularly with regard to clouds.

Clouds are frequently in the form of horizontal sheets, and these are important from the point of view of aerial navigation when they occur at low altitudes. A fairly good example of the upper surface of such a sheet is shown in Fig. 2, but much flatter sheets are sometimes seen. The clouds are caused mainly by the cooling by expansion of water vapour

[1] The accompanying illustrations are from a paper entitled "The Upper Air: Some Impressions Gained by Flying," contributed to the Journal of the Scottish Meteorological Society (vol. xviii., No. 35). We are indebted to the society for the loan of the blocks. The photographs and observations were obtained while flying in France in co-operation with the Meteorological Section R.E., and the author is indebted to the Commandant for facilities in obtaining them and for permission to reproduce them.

which is diffused up by innumerable eddies. In the case of low sheets the process of mixing of saturated air of different temperatures also plays a part, the mixing being carried out by eddies, which are sometimes of a very feeble character and barely perceptible to aeroplanes. Eddy motion is set up by friction with the surface, and usually transmitted to some extent up to about 3000 ft., and sometimes to about 8000 ft., when the air is being heated at the surface. At greater heights eddy motion may be developed throughout a layer 1000 ft. or 2000 ft. thick when the lapse-rate of temperature (vertical temperature gradient) equals the adiabatic rate owing to the intrusion of a cold layer, and if the humidity is high enough clouds may form at the top of the turbulent layer. Sheets of rippled "alto-cumulus" clouds often develop in this way. In order that the clouds may remain in the form of a horizontal sheet, it is important that the lapse-rate above them should be below the adiabatic for saturated air. The majority of cloud-sheets are found under temperature "inversions," where the conditions are most favourable for their persistence. In anticyclones large inversions are often found above the clouds, apparently due to the presence of a mass of air which slowly descends and is dynamically heated, but which fails to reach the ground. For instance, near Ipswich on November 14, 1918, the temperature was 29° F. at the top of the clouds at 3900 ft., and rose to 43° F. at 4200 ft., the relative humidity falling to 23 per cent. It seems probable that on these occasions the lower air has been drawn from a cold source and then warmed at the surface during its passage over relatively warm seas, as there is always an adiabatic lapse-rate and a good deal of turbulence under the clouds, which carries up the moisture from below. The inversion damps out the turbulence and prevents the clouds from mixing with the dry air above, which would dissolve them entirely. The clouds may persist long after the air has begun

FIG. 1.—A cloud-sheet at 8000 ft.; cumulo-nimbus on the horizon; large anvil, with level top at about 20,000 ft., on the right. Note the false cirrus in front of the sun. 5.20 p.m., September 23, 1918.

FIG. 2.—The clouds of Fig. 1 taken ten minutes later. 5.30 p.m., September 23, 1918.

to be cooled at the surface, and travel horizontally for great distances, the air being turbulent just underneath them. In winter they prevent local inland fogs and frost from developing, as they reflect back the radiation from the surface.

In many cases in winter or over the sea accurate forecasts of the height and thickness of the clouds could be made on the assumption that they travel horizontally without change of form. This is true for some cloud-sheets with their lower surface practically on the ground, when the air above them is in a stable condition. On summer days over the land the clouds tend to assume the form of cumulus, but their height and character can often be foretold from the temperature and humidity at different heights.

Figs. 1 and 2 show cumulo-nimbus clouds over the sea which had grown up through a cloud-sheet between 7000 ft. and 8000 ft. There were cumulus clouds from 2500 ft. upwards, and some of them grew up through the cloud-sheet and finally developed into showers or thunderstorms. Those in the photographs resulted in thunderstorms which reached 20,000 ft., lightning being seen after dark. The conditions were unstable, the temperature being 60° at the surface, 49° at 2000 ft., and 6° at 13,000 ft.; the adiabatic for saturated air is 3½° F. per 1000 ft. The lapse-rate just above the cloud-sheet at 8000 ft. was stable enough to allow it to persist for a few hours, except where it was broken through from below. The cumulo-nimbus on the left of Fig. 1 had a very strange form, and had grown larger when Fig. 2 was taken ten minutes later. The clouds moved from W.N.W., but the form of the false cirrus on the top of the cumulo-nimbus gives evidence of the existence of a south-westerly current at 20,000 ft., which possibly caused a slight inversion, and was responsible for the flat top of the distant cumulo-nimbus on the right. The "false cirrus," of which an example is seen in Figs. 1 and 2, consists of thin snow, which is

FIG. 4.—Rounded top of a cumulo-nimbus cloud from which a shower is falling. Snow-shower falling from thin high cloud in background. 8 a.m., September 19, 1918.

FIG. 3.—Large towering cumuli. 6 p.m., May 17, 1918.

originally developed from supercooled water-drops within the cumulo-nimbus cloud. Sometimes also minute ice-crystals, which sparkle in the sun and cause halo phenomena, are found floating about the tops and edges of showers, occasionally below 10,000 ft. Clouds consisting of supercooled drops cause corona rings, and sometimes also fog-bows.

Fig. 3 shows large towering cumuli over the land on a hot summer evening, with their bases at 5000 ft. and their tops fully 15,000 ft. They were caused by very powerful upward currents developed in the lower atmosphere, where the lapse-rate reached the adiabatic for dry air. The lapse-rate above 6000 ft. was close enough to the adiabatic for saturated air to allow the clouds to tower upwards. They finally broke up without developing into thunderstorms. Fig. 4 shows the rounded top of a cloud extending from 2500 ft. to 10,000 ft., which caused a shower. A powerful upward current in the lower air caused the top to rise until it was colder than the air surrounding it, as frequently happens, but it soon sank down again. The temperature was 54° F. at 2000 ft., 40° at 6000 ft., and 30° at 10,000 ft. The photograph also shows a snow shower falling for 2000 ft. or 3000 ft. from a thin high cloud, and then evaporating, and cirro-stratus clouds at a great height.

Many cloud-sheets develop in layers of high relative humidity as the result of gradual vertical movements over a wide area, which may affect stable layers thousands of feet in depth. These vertical movements are associated with the complex wind system which often exists in the lower atmosphere, due to a complex thermal structure. They remain gradual so long as conditions are stable, but may have important consequences with certain distributions of upper-air temperature and humidity. Sometimes clouds develop at about 6000 ft. or 8000 ft., when the temperature is unusually high at their level and the lapse-rate above them is unstable, so that they ultimately grow to thunderclouds with their tops above 20,000 ft. This process must not be confused with that illustrated by Figs. 1 and 2, when the clouds grow up through a cloud-sheet from a low level.

In the front half of depressions the humidity is sometimes high from a low level up to above 15,000 ft., with either a series of cloud-sheets near together or a thin, ill-defined mist of great depth. Steady rain readily develops from such clouds, but this is unlikely to be heavy unless the conditions are unstable. Favourable conditions for heavy rain occur when there is a cold body of surface air to displace the warm, damp current, and also an unstable lapse-rate of temperature in the upper air, so that the warm air rises bodily and parts with its moisture. The lapse-rate is not necessarily high near the surface; it is clear that with a given surface temperature the possible water-content of the atmosphere is much greater when the temperature is high to about 6000 ft. than when it falls off rapidly from the surface upwards.

An interesting problem on which aeroplane observations throw some light is that of visibility. The present writer has made observations in different places which show that much of the smoke from towns and factories travels for hundreds of miles. In winter it usually lies near the ground, but in summer the convection currents carry it up to 6000 ft., and sometimes to 10,000 ft. If there is an inversion above the haze, the top is sharply defined. A little smoke-haze is sometimes met with at great heights, but it is nearly always possible to see the clouds to the horizon.

Regular observations of temperature and humidity in the upper air at several stations would be of great value to forecasters. In particular, they should throw light on the minor irregularities which have such an important influence on the weather, and should enable exact short-period forecasts to be made with greater confidence than has hitherto been possible. The accumulation of data as to the upper-air conditions in the various currents which reach our shores should lead to results of far-reaching importance to meteorology.

C. K. M. DOUGLAS.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

LONDON.—A course of three lectures on "The Principles of Palæobotany" will be given at University College by Dr. Marie Stopes on Thursdays, February 27 and March 6 and 13, at 5 p.m. The lectures will be specially adapted to students of botany and geology, but are open to members of the general public who may be interested in them.

OXFORD.—Congregation has lately approved the preamble of a statute putting the professorship of forestry held by Sir William Schlich on a permanent basis. Ever since the transfer, some fourteen years ago, of the Coopers Hill School to Oxford, the study of forestry has continued to assume increasing importance among the studies of the University. This has been in chief measure due to the zealous activity of Sir William Schlich himself, and to the wise co-operation of several of the colleges, notably Magdalen and St. John's. The recent establishment of a new school of agriculture and forestry, supplementary to the former diplomas in those subjects, is an experiment which will be watched with interest, especially as it met with some criticism in its early stages. But there is much reason to believe that the study of these subjects will attain a still higher degree of efficiency than at present.

Congregation will shortly have before it a statute for the reform of Responsions. This measure, if carried in its present form, will have the effect of making either Latin or Greek optional in the examination, and either mathematics or natural science obligatory.

ST. ANDREWS.—The University Court has announced that, under the will of the late Mrs. Purdie, widow of Emeritus Prof. Purdie, the residue of her estate, amounting to about 25,000*l.*, has been bequeathed to the University. This bequest is to be applied exclusively to the promotion of research in chemistry at St. Andrews, and, together with the existing endowment of the chemical research laboratories, places at the disposal of the University a total of approximately 33,000*l.* for the prosecution of original work in this subject. The gift, the terms of which permit of the income being used for the purchase of research equipment and for the foundation of research scholarships, is a fitting close to a long list of benefactions which the chemistry school of St. Andrews owes to the Purdie family.

The development of the chemistry department of the United College as a centre for research is largely due to the efforts of the late Prof. Purdie, and when, in 1893, the accommodation of the laboratories became insufficient, a new laboratory for undergraduates was presented to the University by his aunt, Mrs. Purdie, of Castlecliff. Ten years later Prof. Purdie built and equipped at a cost of about 15,000*l.* a separate institute for chemical research, and as both the University and the Carnegie Trust joined in the scheme, it was possible to create a special

endowment fund so that workers could carry out their researches without expense. As the numbers increased Prof. Purdie added to the fund, and this prudent measure enabled a steady succession of graduates to remain at the University and acquire training and experience in research. His generous policy has been justified, and, in time, has enabled the St. Andrews laboratory to play an important part in solving many scientific problems arising out of the war.

ON Tuesday, February 18, Dr. C. C. Carpenter, chairman of the South Metropolitan Gas Co., will distribute prizes and certificates at the Sir John Cass Technical Institute, and will deliver an address.

WE are requested to state that the date for the sending in of applications for the Theresa Seessel research fellowships at Yale University has been altered from April 1 to May 1, 1919. Applications, accompanied by reprints of scientific publications and letters of recommendation, together with particulars of the candidate's proposed problem of research, have to be made to the Dean of the Graduate School, Yale University, New Haven, Conn., U.S.A.

REFERRING in NATURE of January 16 to the salaries of university lecturers, Mr. R. Douglas Laurie said: "The Scottish lecturers have been recently granted a graded scale rising to 750*l*." Dr. R. J. T. Bell, University of Glasgow, and Mr. J. K. Wood, University of St. Andrews, write to point out that this scale of salaries has not yet been granted, and that the maximum salaries at present are about half the amount stated. The general councils of the four Scottish Universities have recommended the adoption of the scale, but the University Courts, which are the actual executive bodies, have not yet been able to accept the proposal, though it is understood that the recommendation has met with a sympathetic reception. The difficulty in Scotland, as in other parts of the kingdom, is one of funds, and apparently it can be overcome only by largely increased Treasury grants to the universities.

LT.-COL. C. S. MYERS's recent lectures at the Royal Institution came as a revelation to many scientific men of the important *rôle* which psychology is beginning to play in many departments of practical life. On account of the war the subject has been given special attention, and nobody will dispute the fact of its having made good, both as a source of therapeutic principles in certain types of neurosis and as a means of selecting men for special war service. Long before the war America led the way in showing the applicability of the methods of the psychologist to the problem of selecting the right man for the right job. We now learn that Columbia University is carrying the idea still further. In future, matriculation candidates are to submit themselves to psychological tests with a view to the elimination of those unfit to profit by university studies. Their entrance examinations have apparently not succeeded in excluding candidates who owe their success entirely to special coaching, and for whom a university course is, in fact, a waste of time and effort. We must wait for further information before discussing a scheme which is said to be "based on the Binet formula—whatever that may mean—modified by the tests used in the American War Department." The defects of matriculation examinations as a test of fitness for university work are recognised by all university teachers, and if the Columbia experiment is successful in accomplishing its object the gain will be considerable.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, January 30.—Sir J. J. Thomson, president, in the chair.—Prof. J. C. **McLennan** and R. J. **Lang**: An investigation of extreme ultra-violet spectra with a vacuum grating spectrograph. In this investigation the vacuum grating spectrograph used was designed and constructed by the Adam Hilger Co. The grating had a ruling 2·5 cm. wide and 1·9 cm. in length, of 20,000 lines to the inch. Its radius of curvature was 120 cm. The vacuum arc spectra of mercury, copper, iron, and carbon were investigated. With carbon, wave-lengths were observed and measured down to $\lambda=584$ A.U.—Prof. J. C. **McLennan** and J. F. T. **Young**: The absorption spectra and the ionisation potentials of calcium, strontium, and barium In this paper it is shown that the wave-lengths constituting the series $\delta=(1{\cdot}5, S)-(m, P)$, which are strongly absorbed by the vapours of calcium and strontium, are also strongly absorbed by the vapour of barium. The wave-length of frequency $\delta=(1{\cdot}5, S)$ for barium has been shown to be $\lambda=2380{\cdot}56$ A.U., and the wave-lengths of the two series $\delta=(2{\cdot}5, S)-(m, P)$ and $\delta=(3{\cdot}5, S)-(m, P)$ have been calculated. The wave-length of frequency $\delta=(1{\cdot}5, S)-(2, p_2)$ has been deduced as $\lambda=7901{\cdot}11$ A.U. Assuming that the ionisation potential for barium is given by the relation $Ve=h\delta$, where $\delta=(1{\cdot}5, S)$, the value of this magnitude for barium has been calculated to be 5·21 volts.—Prof. J. C. **McLennan**, D. S. **Ainslie**, and D. S. **Fuller**: Vacuum arc spectra of various elements in the extreme ultra-violet. The experiments described were carried out with a fluorite spectrograph the optical train of which consisted of a 60° prism and two biconvex lenses of 15 cm. focal length. The vacuum arc spectra of copper, zinc, aluminium, carbon, thallium, tin, lead, iron, cobalt, nickel, and cadmium were investigated between $\lambda=2400$ A.U. and $\lambda=1400$ A.U. The measurements obtained for the vacuum arc spectra of copper, zinc, cadmium, and aluminium are well covered by the results for the spark spectrum of these metals, as obtained by previous workers. For tin, lead, and thallium, the results agree fairly well with those given by Saunders from $\lambda=2400$ A.U. to $\lambda=1700$ A.U. Below the region covered by Saunders's work many new lines were observed and measured. The measurements for the vacuum arc spectra of iron, cobalt, nickel, and carbon appear to be the first obtained for the arc spectra of these substances in the Schumann region. For these spectra nearly all the measurements between $\lambda=2400$ A.U. and $\lambda=1850$ A.U., as given in the paper, are covered by previous work on their spark spectra. Within the region between $\lambda=1850$ A.U. and $\lambda=1400$ A.U. a number of new lines were photographed and measured.—R. C. **Dearle**: Emission and absorption in the infra-red spectra of mercury, zinc, and cadmium. In the investigation described in this communication the absorption spectra of mercury, zinc, and cadmium were studied with a Hilger infra-red spectrograph provided with a rock-salt prism and a linear thermopile, in conjunction with a Paschen galvanometer made by the Cambridge Scientific Instrument Co. With each of the vapours the range investigated lay between 1·0μ and 1·6μ. In studying the emission spectrum of mercury vapour bombarded by electrons, it was found that radiation of the wave-length $\lambda=10{,}140$ A.U. was emitted with impact voltages so low as 5 volts, and evidence was also obtained indicating that mercury vapour could be made to emit radiation of this wave-length with impact voltages less than 5 volts. The paper presents

some considerations in support of the view that while mercury vapour has an ionisation potential of one type of 10·4 volts, it may also have an ionisation potential of a second type of about 2·5 volts.—E. **Wilson**: The measurement of magnetic susceptibilities of low order. (1) An instrument which has been designed for the measurement of magnetic susceptibility of low order. It depends for its action upon the pull exerted by an electromagnet in accordance with the well-known Maxwell expression for the mechanical force exerted upon unit volume of the substance. This mechanical force is balanced against the force of torsion in a phosphor-bronze strip. (2) The instrumental constant is determined from data obtained directly with the instrument itself, and by the employment of substances the susceptibilities of which had been measured by other methods. A modified method of using a ballistic galvanometer has been devised which leads to greater sensitiveness. Rock specimens and other substances have been used, and some interesting results obtained. It is shown that the susceptibility of 13 per cent. manganese alloy is much smaller than is usually supposed. (3) The susceptibility of powdered rock specimens has been measured and compared with the solid. A very fair agreement has been obtained between the two, and the method has the advantage that powders can be rapidly made. (4) The susceptibilities of varieties of mica have been measured, and it is shown that in certain cases, in a direction parallel with the laminæ, the susceptibility may be more than fifty-fold that obtained in a direction at right angles thereto. (5) A series of light aluminium alloys has been tested, and it has been found that, whereas the susceptibility of commercial aluminium is increased by alloying with copper and manganese, it is diminished by alloying with cobalt. (6) It is shown that the balance could be used to determine rapidly the relative amounts of ferrous iron in different specimens of glass. (7) Certain specimens of tourmaline have been examined. The green and dark blue opaque varieties have susceptibilities in the direction of the principal crystallographic axis varying from 16 to 20 per cent. less than in a direction at right angles thereto. The susceptibility of rose-coloured tourmaline is very small in comparison. (8) The paper concludes with a note on the retentivity of rock specimens and its possible influence upon magnetic disturbances in magnetic survey work.—Dr. F. **Horton** and Ann C. **Davies**: An experimental determination of the ionisation potential for electrons in helium. An investigation of the minimum potential difference through which an electron must fall in order to be able to ionise an atom of helium on collision with it has been made by methods capable of distinguishing between ionisation of the gas and secondary effects due to radiation. It has been found that radiation is produced when electrons having a velocity of 20·4 volts collide with helium atoms, and that this is not accompanied by any ionisation of the gas. It has also been found that ionisation of the helium does not occur until the velocity of the electrons is raised to 25·6 volts, and that no other type of radiation is produced at this point.

Linnean Society, January 16.—Sir David Prain, president, in the chair.—Capt. A. W. **Hill**: Horticultural work carried out in the military cemeteries in France since 1916. Reference was also made in the paper to the cemeteries in the Italian and other theatres of war. It is intended to make the cemeteries, so far as possible, smooth, well-kept grass-lawns, surrounded by hedges of thorn, beech, or hornbeam, with groups, avenues, or pole-hedges of trees, such as Siberian crabs, limes, hornbeams, willows, etc., and to plant on the graves rose-bushes, iris, and other dwarf carpeting-plants. Steps are also being taken, where possible, to mark the cemeteries where Canadian, Australian, New Zealand, Indian, and other Overseas soldiers lie buried with plants native to the countries whence they came to the defence of the Empire. Allusion was made to the problems which have to be faced in the matter of soil and site, which often render successful gardening work very difficult. Some of the cemeteries are in very sandy places, others in chalk, whilst a number are in the fenland of the Belgian border.

Geological Society, January 22.—Mr. G. W. Lamplugh, president, in the chair.—C. J. **Gilbert**: The occurrence of extensive deposits of high-level sands and gravels resting upon the chalk at Little Heath, near Berkhamsted. In a pit at Little Heath Common, on a plateau of the Chiltern Hills, the following section has been developed:—Surface soil with bleached flint pebbles from the Reading beds, about 2 ft. in thickness; pebbly clay and other Glacial deposits, varying from 2 ft. to 20 ft.; stratified loamy sand, 5 ft. to 6 ft.; stratified coarse gravel, 17 ft.; dark clay, with black-coated, unworn flints and small, well-rounded pebbles, 6 in.; and chalk. The upper Glacial deposit is a pebbly clay. The pebbles are derived from the Reading beds. The clay matrix is tough, and the tints of the clay leave no doubt that it has been derived from the upper part of the Reading beds. The chalk flints are absent, while the small pebbles of white quartz and lydite are seldom met with. On the west side of the pit, underlying the pebbly clay, is a disturbed mass of Glacial sands and clay of miscellaneous character. The whole deposit is suggestive of an englacial origin. Beneath the Glacial beds is a stratified deposit of dark reddish-brown, mottled, loamy sand. The entire deposit is banded with fine lines of grey clay. There is almost invariably a break between the loamy sands and the gravels. The laminæ of the loamy sands do not always follow the contour-line of the beach, but are deposited horizontally. The underlying gravel deposit consists of Reading pebbles and water-worn flints in equal quantities, with an occasional pebble of puddingstone from the Reading beds. No rocks foreign to the district have been found. The gravel becomes coarser in depth, the lower sections containing a high percentage of large, water-worn flints. The small stones are mostly Reading pebbles and white quartz. The gravel is homogeneous. Recent researches indicate that the quartz and lydite pebbles in this district have been derived from the Lower Greensand after the final breach of the Chiltern scarp, in the gaps of which the quartz pebbles are found in such abundance. Reasons are adduced in support of the contention that the loamy sands and gravels are marine deposits laid down in a shallow sea, and that they cannot be of Glacial origin.—G. **Barrow**: Notes on the correlation of the deposits described in Mr. C. J. Gilbert's paper with the high-level gravels of the South of England (or the London Basin). The gravels belong to deposits of which the harder constituents have been derived from two areas, one within the chalk escarpment, the other beyond this escarpment, but within that of the Lower Greensand. The constituents of the former are Reading or other Tertiary pebbles, and flint. Pebbles of sarsen are not uncommon. The pebbles in the latter area consist of white quartz and lydite, all small. "Far-travelled" stones, derived from the Bunter, Carboniferous Limestone, Red Chalk, etc., are absent. Outliers of the finer deposits have been met with. The coarser gravels occur on the south side of the Thames up to above 600 ft.; these all rest on the chalk. It has been pointed out that there must be

corresponding coarser gravels also resting upon the chalk on the north side of the Thames, and the occurrence described by Mr. Gilbert now shows that this is the case.

CAMBRIDGE.

Philosophical Society, February 3.—E. H. **Neville**: The Gauss-Bonnet theorem for multiply connected regions of a surface.—L. J. **Mordell**: The representations of a number as a sum of an odd number of squares.—N. M. **Shah** and B. M. **Wilson**: Certain empirical formulæ connected with Goldbach's theorem.—G. H. **Hardy** and J. E. **Littlewood**: Notes on Messrs. Shah and Wilson's paper entitled "Certain Empirical Formulæ Connected with Goldbach's Theorem."

MANCHESTER.

Literary and Philosophical Society, January 21.—Mr. W. Thomson, president, in the chair.—Discussion on the means by which the society may promote most effectively the advancement and application of learning in Manchester. Among the suggestions put forward were the following:—(1) That while the society should retain its present functions as a learned society, its members might meet with others interested in the advancement of science for informal discussion in the rooms of the society; (2) that special lectures by eminent men on scientific subjects of general interest should be arranged from time to time; (3) that addresses on the practical applications of science by scientific men engaged in industry should be invited; (4) that the presidents of the various scientific societies in Manchester might be made associate or honorary members during their period of office, and that such societies should be invited from time to time to hold special meetings of general interest in the society's house; and (5) that facilities might be arranged for members to consult the library in the evenings, and that arrangements might be made whereby members of other societies should be able on certain terms to use the library.

PARIS.

Academy of Sciences, January 27.—M. Léon Guignard in the chair.—L. **Mangin**: The harmful action of the emanations from the Chedde factory. The fumes from this explosives works are finally converted by the action of moisture into hydrochloric acid. The zone affected is an ellipse ten kilometres by four kilometres. Trees in this area are unequally affected; Epicea is severely damaged and ultimately killed. *Pinus sylvestris* is attacked, but less severely; firs are only slightly injured. Yews and larches show no alteration.—C. **Guichard**: The deformation of quadrics.—E. **Ariès**: Formula giving the latent heat of evaporation of a liquid.—H. **Parenty**: Regulator and meter for the yield of a spring collected by a horizontal or slightly inclined gallery.—M. Wilfred Kilian was elected a non-resident member in succession to the late M. Pierre Duhem.—J. **Drach**: The algebraical solutions of differential equations of the first order.—P. **Montel**: Polynomials of approximation and the existence of differentials.—E. **Maillet**: Determination of the integral points of algebraical unicursal curves with integral coefficients.—C. **Rabut**: Scientific rules and principles for driving long tunnels under a sheet of water. The author's suggestions are summarised under ten headings, everything being subordinated to the prevention of inundation. The apparent economy of the usual method has been proved in practice to be illusory.—J. **Guillaume**: Observations of the sun made at the Lyons Observatory during the third quarter of 1918. Observations were possible on eighty-six days, and tables are given showing the surfaces of the sun-spots, their distribution in latitude, and the distribution of the faculæ in latitude.—G. A. **Le Roy**: Fires produced by Hertzian waves. The investigation of several cases of fire, after careful examination of the facts, has led to the conclusion that probably Hertzian waves were responsible. An instrument is figured and described by which this incendiary action of the Hertzian waves upon various materials has been investigated experimentally. In practice a compressed bale of cotton held by a steel band might be fired by wireless messages in two ways: a band might be broken, leaving the broken ends close together but not in contact, or such bales might be piled in such a manner that short sparks could pass between the rings and set fire to the cotton.—V. **Cremieu**: Experimental researches on gravitation.—M. **Swyngedauw**: The energy losses in the dielectrics of armoured cables.—F. **Bourion** and Ch. **Courtois**: The conditions of utilisation of Schilling's apparatus for the control of industrial hydrogen. For use in ballooning, a direct measure of the density of the gas is the most useful experimental figure, and this is rapidly measured by Schilling's apparatus. The necessity for correcting the indications for moisture is emphasised, and a formula introducing this correction given.—J. **Jolibois** and A. **Sanfourche**: The constitution of nitrous fumes. If air and nitric oxide are mixed in the ratio required to form N_2O_3, the combination is instantaneous; if in the ratio to form N_2O_4, the N_2O_3 stage is rapidly attained, and a further 100 seconds is required to form 92 per cent. of N_2O_4.—J. **Repelin**: A point of history of the Pacific Ocean. The islands of French Polynesia are generally regarded as of entirely volcanic or coral origin. The island of Makatea contains Tertiary deposits, and details of the fossils found are given.—E. **Mathias**: Rain in France. Calculation of the anomalies and of the altitude coefficient. It is shown that in France the altitude coefficient is constant at all points on a geographical parallel.—J. **Pantel**: Calcium, a form of reserve in the female of the Phasmides: its forms of elimination in the two sexes.—C. **Delezenne** and H. **Morel**: The catalytic action of snake-poison on the nucleic acids. Nucleic acid from yeast and thymonucleic acid were treated in neutral solutions with various snake-poisons. Phosphoric acid is produced, 50°–52° C. being the best temperature for the reaction. The snake-poisons vary in their action, the greater toxicity corresponding with greater hydrolytic action towards the nucleic acids.—A. **Vernes**: The graphics of the syphilitic subject. It is impossible to make a certain diagnosis of syphilis from a single examination of serum, since if is only from the form of the curve obtained from a series of successive examinations that a decisive conclusion can be drawn.—R. **Douris**: The use of heated sera in the Vernes sero-reaction (sero-diagnosis of syphilis).—A. **Berthelot**: Biochemical researches on war-wounds. Searching for the presence of micro-organisms in wounds analogous with *B. aminophilus*, and capable of forming the ptomaine β-imidoazoethylamine from histidine, such bacilli were discovered in cases of gas gangrene and large crushed wounds.—Em. **Bourquelot** and M. **Bridel**: Simultaneous biochemical syntheses of gentobiose and two β-glucosides of glycol by emulsin.—F. **Diénert** and A. **Guillerd**: Aqueous autolysed yeast for the culture of *B. coli*. The continuous rise in the price of peptone has led to a search for more economical media, and a method is described starting with pressed yeast. It has been found that peptone broth costing 3 francs per litre can be perfectly replaced by autolysed yeast broth costing 20 centimes per litre.—A. **Paillot**: Pseudo-fatness, a new disease of the larva of *Lymantria dispar*. The disease is caused by a new coccobacillus, which has been isolated and named *Bacillus lymantricola adiposus*.

BOOKS RECEIVED.

Indian Industrial Commission Report, 1916–18. Pp. xx+355+xviii. (Calcutta: Superintendent Government Printing, India, 1918.) 1s. 6d.

Man's Supreme Inheritance: Conscious Guidance and Control in Relation to Human Evolution in Civilisation. By F. M. Alexander. With an Introductory Word by Prof. J. Dewey. Second edition, revised. Pp. xxviii+239. (London: Methuen and Co., Ltd., 1918.) 7s. 6d. net.

A First Course in the Calculus. Part i., Powers of X. By Dr. W. P. Milne and G. J. B. Westcott. Pp. xx+196. (London: G. Bell and Sons, Ltd., 1918.) 3s. 6d.

Fossil Vertebrates in the American Museum of Natural History. Department of Vertebrate Palæontology. Vol. vi., Articles Collected from the American Museum Bulletin of the Years 1915–17. By H. F. Osborn and others. Collected and issued for purposes of sale and exchange. (New York: The American Museum of Natural History, 1918.)

Introductory Lecture to the Classes in Metallurgy in the Royal Technical College, Glasgow, at the Opening of the Session, 1918–19. By Prof. C. H. Desch. (Glasgow: James Maclehose and Sons, 1919.)

Annuaire pour l'an 1919, publié par le Bureau des Longitudes. Pp. viii+524+A60+B27+C69. (Paris: Gauthier-Villars et Cie, n.d.) 3 francs net.

Trattato di Chimica Generale ed Applicata all' Industria. Vol. i. Chimica Inorganica, parte seconda, quarta edizione riveduta ed empliata. By Prof. D. E. Molinari. Pp. x+561–1190. (Milano: Ulrico Hoepli, 1919.) 26 lire.

Imperial University of Tokyo. Calendar 2577–78 (1917–18). Published biennially. Pp. iv+402+tables and plates. (Tokyo: The University.)

The British Journal Photographic Almanac and Photographer's Daily Companion, 1919. Edited by G. E. Brown. Pp. 644. (London: H. Greenwood and Co., Ltd., 1919.) 1s. 6d. net.

DIARY OF SOCIETIES.

THURSDAY, FEBRUARY 13.

ROYAL INSTITUTION, at 3.—Dr. W. Wilson: The Movements of the Sun, Earth, and Moon.

ROYAL SOCIETY, at 4.30.—Hon. R. J. Strutt: Scattering of Light by Solid Substances.—L. Bairstow and A. Berry: Two-Dimensional Solutions of Poisson's and Laplace's Equations.—Dr. G. H. Thomson: The Cause of Hierarchical Order among the Correlation Coefficients of a Number of Variates taken in Pairs.—Dr. G. N. Watson: The Transmission of Electric Waves round the Earth.

MATHEMATICAL SOCIETY, at 5.—Prof. H. S. Carslaw: Diffraction of Waves by a Wedge of any Angle.—T. C. Lewis: Properties of Pentaspherical Co-ordinates.

INSTITUTION OF ELECTRICAL ENGINEERS, at 6.—Bt.-Lt.-Col. W. A. J. O'Meara: The Functions of the Engineer: his Education and Training.

CHILD-STUDY SOCIETY, at 6.—Dr. C. W. Kimmins: The Significance of Children's Dreams.

OPTICAL SOCIETY, at 7.—Annual General Meeting.—At 7.30.—Lord Rayleigh: A Possible Disturbance of a Range-finder by Atmospheric Refraction due to the Motion of the Ship which carries it.—L. C. Martin and Mrs. Griffiths: Deposit on Glass Surfaces in Instruments.

FRIDAY, FEBRUARY 14.

ROYAL ASTRONOMICAL SOCIETY, at 5.—Anniversary Meeting.

ROYAL INSTITUTION, at 5.30.—Prof. C. G. Knott: Earthquake Waves and the Interior of the Earth.

MALACOLOGICAL SOCIETY, at 7.—Annual General Meeting.

MONDAY, FEBRUARY 17.

ROYAL SOCIETY OF ARTS, at 4.30.—Prof. J. A. Fleming: Scientific Problems of Electric Wave Telegraphy.

ROYAL GEOGRAPHICAL SOCIETY, at 5.—Commander H. D. Warburg: The Admiralty Tide Tables and North Sea Tidal Predictions.

TUESDAY, FEBRUARY 18.

ROYAL INSTITUTION, at 3.—Capt. G. P. Thomson: The Development of Aeroplanes in the Great War.

BRITISH ASSOCIATION GEOPHYSICAL COMMITTEE (Royal Astronomical Society), at 5.—Prof. H. H. Turner: Report on Seismology.—G. W. Walker: Account of Certain Seismological Instruments described by the Late Prince Galitzin.

ROYAL STATISTICAL SOCIETY, at 5.15.—Capt. M. Greenwood: Problems of Industrial Organisation.

INSTITUTION OF PETROLEUM TECHNOLOGISTS, at 5.30.—Montagu Summers: The Financing of Oilfields.

ZOOLOGICAL SOCIETY, at 5.30.—R. I. Pocock: The External Characters of the Existing Chevrotains.—K. M. Smith: A Comparative Study of Certain Sense-organs in the Antennæ and Palpi of Diptera.

WEDNESDAY, FEBRUARY 19.

ROYAL SOCIETY OF ARTS, at 4.30.—Dr. J. F. Crowley: The Use of Electricity in Agriculture in Germany.

ROYAL METEOROLOGICAL SOCIETY, at 5.—Dr. S. Chapman: The Lunar Tide in the Earth's Atmosphere.—Miller Christy: The Gunfire on the Continent during 1918: Its Audibility at Chignal St. James, near Chelmsford.

ROYAL AERONAUTICAL SOCIETY, at 8.—C. Grahame White: Civil Aerial Transport—Is it Practicable, is it Safe, and is it Profitable?

ROYAL MICROSCOPICAL SOCIETY, at 8.—J. E. Barnard: Presidential Address—The Limitations of Microscopy.

THURSDAY, FEBRUARY 20.

ROYAL INSTITUTION, at 3.—Prof. H. M. Lefroy: Insect Enemies of our Food Supplies.

ROYAL SOCIETY, at 4.30.—*Probable Papers*: Jean Dufrenoy: Note on the Metabolism of the Glucosides of the Arbutin Group.—S. S. Zilva and E. M. Wells: Dental Changes in the Teeth of the Guinea-pig produced by a Scorbutic Diet.—W. E. Bullock and W. Cramer: A New Factor in the Mechanism of Bacterial Infection.—Major W. J. Tulloch: The Distribution of the Serological Types of *B. tetani* in Wounds of Men who received Prophylactic Inoculation, and a Study of the Mechanism of Infection in, and Immunity from, Tetanus.

INSTITUTION OF MINING AND METALLURGY, at 5.—S. J. Truscott: Slime Treatment on Cornish Frames: Supplements.—Edwin Edser: The Comparison of Concentration Results, with Special Reference to the Cornish Method of Concentrating Cassiterite.—C. W. Gudgeon: The Giblin Tin Lode of Tasmania.—G. F. J. Preumont: Notes on the Mining of Wolfram in Bolivia.

INSTITUTION OF ELECTRICAL ENGINEERS, at 6.—G. L. Addenbrooke: Dielectrics in Electric Fields.

CHEMICAL SOCIETY, at 8.

FRIDAY, FEBRUARY 21.

GEOLOGICAL SOCIETY, at 3.—Annual General Meeting.

ROYAL INSTITUTION, at 5.30.—A. T. Hare: Clock Escapements.

INSTITUTION OF MECHANICAL ENGINEERS, at 6.—Annual General Meeting.

SATURDAY, FEBRUARY 22.

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